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SEVERIN (H. H. P.). **Newly discovered leafhopper vectors of California Aster-yellows virus.**—*Hilgardia*, xvii, 16, pp. 511–523, 1 col. pl., 1947.

In single insect tests both the short- and long-winged forms of *Macrosteles divisus* transmitted California aster yellows virus to celery and asters in addition to those already reported [*R.A.M.*, xxvi, p. 525 and next abstract]. Transmission rates to celery were increased when these and other species of leafhopper were used in lots of 5 to 40 per plant, and to aster with *Cloanthanus irroratus*. The latter retained the virus for a maximum of 15 days, *C. dubius* and *Euscelis maculipenis* for 29 and 59 days, respectively.

SEVERIN (H. H. P.). **Longevity of non-infective and infective leafhoppers on a plant non-susceptible to a virus.**—*Hilgardia*, xvii, 16, pp. 541–543, 1947.

The results of investigations carried out in California into the death rate of non-infective and infective short- and long-winged adult leafhoppers, *Macrosteles divisus*, kept on a plant non-susceptible to California aster yellows virus [see preceding abstract], indicate that the virus is neither beneficial nor harmful to the insects.

WALLACE (G. B.). **Annual Report of the Plant Pathologist, 1945.**—*Rep. Dep. Agric. Tanganyika, 1945*, pp. 144–147, 1948.

In this report [cf. *R.A.M.*, xxv, p. 154] it is stated that the suspected virus disease of sweet potato [loc. cit.] found in Tanganyika Territory is now known to be present north of and along the Central Railway. No variety examined has been found immune, and several indigenous species of *Ipomoea* show virus symptoms. Other sweet potato diseases recently recorded locally are foot rot (*Plenodomus destruens*) [ibid., xxvi, p. 145], root disease (*Macrophomina phaseoli*), and leaf spot due to a species of *Cercospora*. Foot rot seems to be as widely distributed as the virus disease, and is destructive; only healthy vines should be used for propagation.

Phytophthora infestans is widely distributed on Irish potatoes, but the Bukoha District and Songea still appeared to be unaffected. *Xanthomonas solanacearum*, recorded in Kenya in 1944 [ibid., xxv, p. 472], was found in a potato field near Lushoto. The same organism caused considerable loss in one tomato plot at Lyamungu. To date *Stachylidium theobromae* [ibid., xix, p. 643] has been recorded on five Kilimanjaro varieties of banana.

Other new records [cf. ibid., xxvii, p. 158] include an olive leaf spot due to (?) *Coniothyrium oleae*, a sorghum leaf spot closely resembling *Titaeospora andropogonis* [ibid., xxv, p. 260], and *Cercospora atricincta* [ibid., xxiii, p. 410] on *Zinnia elegans*. Wheat stem [black] rust (*Puccinia graminis*) was again destructive in the Northern Province, the forms identified being K1 on Kenya Governor at Mkulumbul, K2 on the Ardai, and probably K2 on SL3 and Reward at Mkulumbul [cf. ibid., xxvii, p. 312].

EASTHAM (J. W.). **Report of Plant Pathologist.**—*Rep. B.C. Dep. Agric., 1947*, pp. R86–R95, 1948.

In the section of this report [cf. *R.A.M.*, xxvi, p. 440] dealing with plant diseases, W. R. FOSTER states that little cherry remains the most serious disease in British Columbia. Control regulations were put into force in order to protect the Okanagan, the largest cherry-growing area in the Province, but the difficulty is to detect the disease early, especially in the Bing variety. So far, the trouble does not appear to have reached the Okanagan, though a few trees were seen in the southern Okanagan with a small-cherry condition which might be confused with it. T. B. Lott, of the Dominion Plant Pathology Laboratory, Summerland, has had this condition, which he terms 'small bitter cherry', under observation since 1940 [ibid., xxvii, p. 28]. In the Kootenays, little cherry is spreading rapidly. Every cherry-growing district in the locality appears to be affected, and few healthy trees remain. In one of the most recently affected areas, five orchards which showed 155 affected trees in 1946, a year later had 723. The difficulty of early detection was observed in a mapped orchard. A number of Bing trees showing definite symptoms for the first time in 1946 appeared normal in 1947. In areas where the disease has been general for 7 to 14 years, the average amount of Bings large enough for the fresh fruit trade has been about 5 per cent. In Lambert, the commonest variety in the Kootenays, no fruits are usually large enough after two or three years. It is hoped that a quick method of early detection will be found before the disease reaches the Okanagan. Two apparently normal Lambert trees have been found in affected areas; both are under observation and experiment to ascertain whether they are infected or not in the hope they may provide the solution to the problem of control.

Plum black knot [*Dibotryon morbosum*] can be made of minor importance in the Fraser Valley with the co-operation of all growers and of those municipalities that have affected trees growing along the roads. Co-operation or community effort is necessary before satisfactory control can be obtained because spores can be carried by the wind from affected trees. The most important control measure is to cut out all the black knots before 1st March at least 4 in. below the knot. Developing knots should be cut out in summer before they turn black. Spraying with lime-sulphur (1 in 10) or Bordeaux mixture (4–6–40) in the dormant stage just before bud burst is supplementary.

No potato bacterial ring rot [*Corynebacterium sepedonicum*] was found in or received from any commercial or certified seed crop grown in British Columbia in 1947.

At the beginning of 1947 a strawberry certification scheme was inaugurated to assist growers in avoiding the introduction of red stele disease [*Phytophthora fragariae*: ibid., xxiv, p. 325; xxvi, p. 440] into non-infected land. To secure certification, the plantation, in addition to being free from the disease, must also be vigorous and reasonably exempt from leaf scorch [*Diplocarpon earliana*: ibid., xxv, p. 385], leaf spot [*Mycosphaerella fragariae*: loc. cit.], insect pests, and virus diseases. Only runners from maiden plants are certified.

Urocystis cepulae was reported on onions for the first time in British Columbia in one field near Kelowna. The control of tomato leaf mould [*Cladosporium fulvum*], particularly in the second crop, has again become a problem, since Vetomold and V 121 are no longer resistant. Tomato *Verticillium* wilt [*V. albo-atrum*] remains troublesome in the Lillvoet district, but was only half as serious as in 1946 [ibid., xxvi, p. 441]. Severity is increased locally by the coldness of the irrigation water, excessive irrigation, the ploughing in of old, diseased plants, and the continued use of the same land for tomatoes. The most effective preventive method under greenhouse conditions appears to be steaming and warming the soil before planting by means of the buried tile technique. The variety Sioux was susceptible to wilt but was little affected by sun scald and gave a high yield.

STOUT (G. L.). **Permanent surveys for plant diseases.**—*Bull. Dep. Agric. Calif.*, xxxvii, 1, pp. 25–28, 1948.

A programme of permanent surveys for plant diseases was begun in California in July, 1947. Such surveys imply a continuous and methodical search of economic crops and other possible hosts and hiding places for infectious plant diseases which may be capable of serious damage. These surveys should constitute a regular, constant patrol of the vegetation of the State throughout all seasons, as biological factors permit. Three classes of disease should receive attention: (1) diseases not known to be present in the United States, (2) diseases known to be present but not yet recorded in California, and (3) diseases present in California but not yet widely distributed.

There are 10,000,000 acres under cultivation and about 475 persons are employed in the county departments of agriculture, at least 400 of whom spend time in the field. In addition, some counties may perhaps be prepared to employ special staff for this work. Training will be directed by the three State survey pathologists. In addition, pathologists of the State, the University of California, and the local federal departments are constantly on the alert for new pests in the course of their field work.

Since the programme was begun no diseases not previously known in California have been found, but new information was obtained on the distribution of certain diseases. Cherry bark blister was observed in Contra Cista county; this disease, the cause of which has not yet been ascertained, produces leaf spot, a blistering and killing of the bark, and a necrosis of the spurs and limbs resulting in a decline. Cherry rasp leaf [*R.A.M.*, xxiv, p. 324], previously known in one orchard in Alameda County and one in Riverside County, was found in Contra Costa and San Joaquin counties. Vine mosaic [virus: ibid., xxvi, p. 189], first reported in 1943 in a single vineyard in Napa County, was found in Santa Clara and San Joaquin. Club root of crucifers [*Plasmodiophora brassicae*], previously believed to be rare in California, is now known to be spreading in the Colma District, San Mateo County; it was found not only in the field, but in seed-beds, from which it was being spread. Peach wart [virus: ibid., xxvi, pp. 19, 189] has now been found in three counties; all the affected trees have been removed. Peach rusty spot [ibid., xxvi, p. 249] has been found in a few instances in four counties, mainly on the Rio Oso Gem variety.

Sixtieth Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending 30th June, 1947.—128 pp., 8 figs., 4 graphs, 1947.

This report [cf. *R.A.M.*, xxvii, p. 119] contains the following items of phytopathological interest. A. J. ULLSTRUP found that in an artificially induced epidemic of leaf blight (*Helminthosporium turcicum*) [ibid., xxvi, p. 11] the maize inbred lines Minn.A 71, HK 59, and Ky 41–181 showed resistance to the disease. Of 35 F_2 progenies, all having Mo. 21A for resistant parent, 45 plants were selected as highly resistant. C.I. 14, Jarvis 528, and 461–3 were extremely resistant to *H. maydis* [*Cochliobolus heterostrophus*: ibid., xxv, p. 556] in an artificially induced epidemic.

R. W. SAMSON states that in 1946 tomato crops were again attacked by blight (*Phytophthora infestans*) [ibid., xxvii, p. 119], though to a lesser extent than in 1945. These are the only records of the disease on tomatoes in Indiana and are attributed to the abnormally cool weather during July and August in both seasons.

In late May and early June, 1945, and in 1946 serious epidemics of blight on very early potatoes occurred in southern districts, these being the earliest dates so far reported from Indiana.

E. C. Stair, J. D. Hartman, and R. W. Samson compared 62 canning tomato varieties and new lines with Indiana Baltimore in poor soil heavily infested with *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: loc. cit.]. The latter variety was completely destroyed, while most of the lines remained free from wilt.

J. H. Lefforge, R. M. Caldwell, and N. K. Ellis report that three new mint clones resistant to *Verticillium* wilt (*V. albo-atrum*) [ibid., xvi, p. 491; xxiv, p. 248], leaf rust [*Puccinia menthae*: loc. cit.], and mildew [?*Phyllactinia corylea*] yielded more oil than did *Mentha piperita*. In greenhouse tests in which the roots of cuttings were dipped in suspensions of *V. albo-atrum*, hybrids from tetraploid *M. piperita* crossed with *M. crispa*, *M. spicata*, and *M. arvensis piperascens* showed moderate resistance to wilt, *M. rotundifolia* appeared to be quite resistant, while *M. gentilis*, *M. crispa*, and *M. spicata* showed various degrees of resistance. These results were confirmed in field tests in naturally infested soil.

A. J. Ullstrup states that in maize seed treatment tests [ibid., xxv, p. 340; xxvi, p. 347] U.S. 13 (consisting of sound and mechanically injured grain) treated with arasan, semesan jr., spergon, and 1452F, only in the early planted (30th April) series was the rate of emergence higher than for the untreated control, the increase being especially conspicuous in the damaged grain. Seed treated with arasan, phygon, or spergon and planted on 26th April showed a significantly better stand than that treated with barbak C, semesan jr., or 33J–4, the last two being significantly better than the untreated. Arasan, phygon, and semesan jr. seed lots produced significantly higher yields than the untreated, the arasan-treated yielding 92·9 bush. per acre, the control 82·1.

J. R. Shay reports that weather conditions during the past three or four years have favoured the epidemic development of apple scab [*Venturia inaequalis*], and control has been especially difficult. Spraying the overwintered leaves with ½ per cent. elgetol [ibid., xxvii, p. 117] by means of a special boom at 600 gal. per acre reduced the numbers of ascospores released from leaves by 95 per cent. This suppression of the primary inoculum resulted in late May in a 76 per cent. reduction in fruit lesions even on unsprayed trees. By harvest time the disease reduction was only 31 per cent. The ground-sprayed part of the orchard treated throughout the season with fermate (2 to 100) showed 17·5 per cent. infected fruit at harvest, wettable sulphur (8 to 100) 25·4, puratized (5 per cent. active at 1 pint to 100) 19·2, lime-sulphur (2 gals. to 100) 19·4, and untreated 70·1.

The same author states that the Illinois and Purdue Agricultural Experiment Stations are co-operating in breeding scab-resistant apple varieties. Tests showed that 21 selections of *Malus* spp. possess and transmit to their progenies a type of resistance that prevents the development of the fungus on leaves and fruit. During 1946, 5,365 seeds from crosses of scab-resistant selections with commercial apple varieties were germinated for the seedlings to be inoculated with *V. inaequalis* for further selection.

Darpoux (H.) & Faivre-Amiot (A.). **Sur un Actinomycète doué de propriétés bactériolytiques remarquables.** [On an Actinomycete endowed with remarkable bacteriolytic properties.]—*C.R. Acad. Sci., Paris*, ccxxvi, 14, pp. 1146–1148, 1948.

An Actinomycete provisionally designated *Streptomyces* 105 develops in potato dextrose agar cultures antibiotic substances which exerted a powerful lysogenic action in laboratory experiments on the following phytopathogenic bacteria: *Phytomonas* [*Pseudomonas*] *tabaci* (tobacco wildfire) *Phytomonas* [*Bacterium*] *mori* (mulberry gummosis), *P.* [*Xanthomonas*] *campestris* (black leg of crucifers), *Pseudomonas medicaginis* (lucerne stem rot), *P. medicaginis* var. *phaseolicola* (grease spot of bean [*Phaseolus vulgaris*]), and *Erwinia phytophthora* (potato blackleg). A veil of *Pseudomonas tabaci* covering the surface of a potato dextrose agar

culture in a Petri dish 9 cm. in diameter disappeared completely 12 to 18 days after the application of the *Streptomyces* at ten points; in the other cases the lytic zone developed in 24 hours but then remained stationary at a radius of 0·5 to 2 cm.

S. 105 also proved strongly lysogenic to a species of *Botrytis* and *Sclerotinia libertiana* [*S. sclerotiorum*].

Twelve hours' immersion of tobacco seed infected by *P. tabaci* in the unfiltered culture liquid of *Streptomyces* 105 completely prevented the development of wildfire. The seedlings arising from the treated material, protected from reinfection by the antibiotic barrier raised by the colonies of the organism in the soil, were in full vigour 45 days later.

GOODMAN (J. J.) & HENRY (A. W.). **A strain of Bacillus subtilis possessing distinctive antibiotic properties towards Xanthomonas translucens and other bacteria.** —Abs. in *Proc. Canad. phytopath. Soc., 1947*, 15, p. 19 [?1947].

A rough strain (A 32) of *Bacillus subtilis*, isolated from Edmonton soil, was found to be relatively nonphytotoxic and to display marked antagonism towards certain bacteria, particularly *Xanthomonas translucens*. Liquid media in which A 32 had grown, when extracted with n-butyl alcohol gave a fraction which differed in several respects from subtilin [*R.A.M.*, xxvi, p. 447], while A 32 itself could be distinguished from the subtilin-producing strain of *B. subtilis*. The active substance produced was excreted into the culture fluid and, unlike subtilin, was not found in the cellular debris. A 32 sporulated more readily than the subtilin-producing strain, was much less adherent to an agar slant, grew on media of much lower asparagine content, and did not give a blue reaction with ferric chloride.

All form species of *X. translucens* tested were sharply inhibited by the n-butyl alcohol extract from A 32. *Pseudomonas coronafaciens*, *Erwinia carotovora*, and *Agrobacterium* [*Bacterium*] *tumefaciens* were also susceptible, as were several other strains of bacteria. Some of these organisms were also susceptible to subtilin (1 in 1,000), though less so, but some, such as *E. carotovora* and *Bact. tumefaciens*, were resistant to it.

SPRAGUE (R.), FISCHER (G. W.), & MEINERS (J. P.). **Some new disease records of Gramineae in the western United States.**—*Plant Dis. Reptr*, xxxii, 3, pp. 98–114, 1948. [Mimeographed.]

This co-operative study lists the diseases of grains and grasses found in Idaho, Utah, Arizona, New Mexico, eastern and southern California, western Nevada, and eastern Oregon, during June, 1947, including numerous apparently new State disease records, together with some new records for Washington. The records for each State are listed alphabetically under hosts. The report is published as Paper No. 765 of the Washington Experiment Station.

EL-HELALY (A. F.). **The prevention of black stem rust of Wheat.**—*Phytopathology*, xxxviii, 3, pp. 161–184, 4 figs., 1948.

Black rust of wheat (*Puccinia graminis*) is widely distributed in Lower, and to a lesser extent in Middle Egypt, where it may be responsible for heavy damage and serious losses in the staple winter crop of the country [*R.A.M.*, xx, p. 249]. The incidence of the disease is promoted by unduly frequent waterings. In experiments with nitrogenous fertilizers the expected increase in yield did not materialize because of the increased development of rust. Early sown crops tend to escape the ill effects of black rust, which develops on them only after seed formation when ripening is imminent. In tests of varietal reaction to *P. graminis* in 1941–2 selections of Baladi proved resistant or virtually immune in contrast to the susceptible Hindi.

The most effective control of the disease, resulting in the maximum net profit per feddan (1·47 acre) of £1 to £10 (Egyptian) in one experiment and £1 to £4 in another, was obtained by spraying with 1·25 or 2·5 per cent. lime-sulphur, the initial treatment, just before or at the time of the first appearance of the rust, in the field (first half of March), being preferably followed by a further one or two at two- to three-weekly intervals. Spraying with kolofog, wettable sulphur, amberine, sulsol, bouisol, and Bordeaux mixture, and dusting with flowers of sulphur and kolodust gave less satisfactory results.

Asthana (R. P.). **Wheat rusts and their control.**—*Mag. agric. Coll. Nagpur*, xxii, 2–4, pp. 136–143, 1948.

After stating that during 1946–7 wheat rusts (*Puccinia graminis*, *P. triticina*, and *P. glumarum*) are estimated to have caused losses amounting to 2,000,000 tons in the chief wheat-growing provinces of India [*R.A.M.*, xxvii, pp. 314, 315], the author discusses the sources of infection in different Asiatic countries [ibid., vii, pp. 232, 233]. He considers that rust epidemics on wheat in India can be controlled effectively if taken on a country-wide basis with the full co-operation of all the Provinces, States, and neighbouring countries. Brief notes are given on the control measures in use in India at the present time, and the author concludes that the simplest and probably the cheapest method is the use of resistant varieties.

Chester (K. S.) & Preston (D. A.). **Experimental forecast of Wheat leaf rust in Oklahoma for 1948.**—*Plant Dis. Reptr*, xxxii, 5, pp. 176–181, 1 fig., 1948. [Mimeographed.]

The forecasted low incidence of brown rust (*Puccinia rubigo-vera* var. *tritici*) [*P. triticina*] in Oklahoma for 1947 [*R.A.M.*, xxvi, p. 445] was confirmed in further pre-harvest surveys in May and June, 1947, and the very slight damage caused by the disease was presumably one of the main factors in the record wheat production in that year.

Owing to a drought the planting of the new crop was delayed until November and December, the usual infection of seedlings by air-borne rust spores from the north thus being prevented. Leaves of several rust-susceptible wheat varieties examined at ten-day intervals from 1st February to 31st March, 1948, at Stillwater, revealed not a single rust pustule and none was found in an extensive survey in other Oklahoma counties, except for a negligible amount in the south-western corner of the State. The prospect for a rust-free crop in 1948 appears to be the best for ten years.

McKeon (B. F.). **Cereal investigations in the Wimmera.**—*J. Dep. Agric. Vict.*, xlvi, 2, pp. 73–81, 6 figs., 1948.

Wheat variety trials carried out at the Cereal Experiment Station, Longerenong Agricultural College, Wimmera, Victoria, have shown that Pinnacle, a new wheat variety bred by G. S. Gordon and released in 1946, is as highly resistant to flag smut [*Urocystis tritici R.A.M.*, xxv, p. 301] as Ghurka and Quadrat. Insignia is also resistant to flag smut and is less susceptible to rust [*Puccinia graminis* and *P. triticina*] than its parent Ranee.

Lansade [(M.).] **Sur l'efficacité de quelques produits contre la carie.** [On the efficacy of certain products against bunt.]—*C.R. Acad. Agric. Fr.*, xxxiv, 3, pp. 162–166, 1948.

Further experiments were carried out in France in 1945 and 1946 with a large number of dusts on the control of wheat bunt [*Tilletia caries*: *R.A.M.*, xxvi, p. 294], using copper sulphate (containing 24·8 per cent. copper at 5 dilutions with talc), cuprous chloride (59·4 per cent. copper, at 9 dilutions), cupric chloride (37 per cent.

copper, at 12 dilutions), copper oxychloride (56 per cent. copper, at 9 dilutions), copper carbonate (56·6 per cent. copper, at 4 dilutions), hexachlorobenzene (pure, 12 dilutions), and a mercuric derivative of ethane (4 dilutions with silicate). The rate of treatment was 200 gm. dust per 100 kg. seed.

The results obtained showed that the limits of efficacy expressed as a percentage of the active substance were as follows: copper sulphate, 24·8; cuprous chloride, 14; cupric chloride, distinctly the most active of the copper salts tested, 8; copper oxychloride, 23 to 25; hexachlorobenzene, 5-6; copper carbonate was not efficacious even in the pure state (9·2 per cent. bunt). Even at the highest concentrations hexachlorobenzene was harmless and thus constitutes a remarkable antibunt material. The ethane derivative was effective at 1·5 and 9 per cent. mercury, but at higher concentrations it prevented germination. In practice these figures should be increased by a 'safety margin' of 4 or 5 per cent. for cuprous chloride, cupric chloride, and copper oxychloride and of 8 to 9 per cent. for hexachlorobenzene.

Leasure (J. K.), Down (E. E.), & Brown (H. M.). **The correlation of certain characters with yield in Barley strains.**—*J. Amer. Soc. Agron.*, xl, 4, pp. 370–373, 2 figs., 1948.

In 1946, 75 barley strains resistant to mildew [*Erysiphe graminis*: *R.A.M.*, xxvi, p. 296] were grown at the Michigan State College. Measurements were made and simple correlations determined between yield and height of plant, length of head, breaking strength of straw, and test weight. Although some significant correlations were established, no character was closely enough associated with yield to be of decisive value in a selection programme.

Timonin (M. I.). **Microflora of the rhizosphere in relation to the manganese-deficiency disease of Oats.**—*Proc. Amer. Soc. Soil Sci.*, xi, pp. 284–292, 1947. [Abs. in *Chem. Abstr.*, xlii, 9, p. 3118, 1948.]

A variety of oats susceptible to manganese deficiency [*R.A.M.*, xxiii, p. 99] harboured in its rhizosphere a denser population of manganese-oxidizing, casein-hydrolysing, and denitrifying bacteria than did a resistant variety when grown in the same soil and under identical conditions at the Department of Agriculture, Ottawa, Canada. Applications of soil fumigants, e.g., chloropicrin, cyanogas-calcium cyanamide, and formaldehyde, greatly reduced or completely eliminated the manganese-oxidizing bacteria. Plants grown in soil thus treated were free from manganese deficiency symptoms and showed a marked increase in grain yield. On the other hand, straw mulch applications resulted in a denser population of manganese-oxidizing, cellulose-decomposing organisms, more severe symptoms, and a lower grain yield than on the untreated areas. A significant positive correlation was established between severity of the disease and manganese-oxidizing (0·8939) and cellulose-decomposing (0·6117) organisms. By means of the cyanogas, chloropicrin, carbon disulphide, formaldehyde, and cyanamide treatments, a highly significant difference in grain yield was obtained as compared with that from the untreated plots. Practical control of manganese deficiency and the second highest grain yield resulted from an amendment of 190 lb. per acre commercial calcium cyanamide.

Haenseler (C.M.). **Varietal susceptibility of Winter Oats to snow mold (Fusarium nivale) in New Jersey.**—*Plant Dis. Reptr*, xxxii, 5, pp. 175–176, 1948. [Mimeographed.]

Following a severe outbreak of snow mould caused by *Fusarium nivale* [*Calonectria graminicola*: *R.A.M.*, xxiv, p. 178; xxvi, p. 538] on winter oats at the New Jersey Agricultural Experiment Station, in February, 1948, Forkadeer, Lee,

Pioneer, Stanton, Traveler, Winter Turf, Wintok, and CI 4316 were tested for resistance on plots replicated three times. Wintok showed a total of 255 snow mould spots and Traveler 110, while none of the other varieties developed any infection.

ROSEN (H. R.). **Red spot mosaic of Oats.**—*Plant Dis. Reptr*, xxxii, 5, pp. 172–175, 1948. [Mimeographed.]

Since 1942 various oat varieties in Arkansas have been affected by a red spotting and mottling of leaves, presumably due to a virus or virus group; such leaves turn brownish at a later stage and tend to die prematurely. On Traveler the symptoms, which occur on any part of the blade or sheath, vary from minute, ill-defined dark dots, dashes, and streaks to large, well-defined, reddish-brown spots (1 to 2 cm. by 5 mm.) with darker centres and occasionally conspicuous, vividly purplish-brown margins. On other varieties the spotting is more localized and appears mostly at the tips of the leaves.

The disease appears to be most destructive, especially on winter oats, in March and early April, but a crop that appears a failure may recover within a month and yield as much as 90 bush. per acre. Only a few plants in a field may remain stunted and fail to produce shoots, or retain a rosetted appearance.

When the diseased leaves were transferred to moist chambers the red spots turned yellowish and various fungi were found sporulating on them, *Hormodendrum* [*R.A.M.*, xxii, p. 395] being the most common. Under laboratory conditions at 65° F. and subdued northern daylight the diseased plants lost some of the red pigment within 48 hours, the spots becoming gradually yellowish. Characteristic mosaic symptoms developed, namely, chlorotic streaks, often beginning at the apex and extending one-third or more of the length of the leaf, and mottling of light and dark green areas, the darker green apparently replacing the minute dots and dashes observed under field conditions. After three or four days 90 per cent. of the leaves became markedly chlorotic, while resistant plants under the same conditions remained healthy.

Although the disease is not economically important on the varieties grown at present, attempts were made to control it. Progenies of apparently healthy plants growing in affected fields were increased. One such line, Traveler 15, showed good resistance but also comprised a few susceptible plants. Through further single-plant selection a progeny was obtained which was fully resistant in 1948.

Of Victoria derivatives, Traveler, Stanton, Letoria, and Fulgrain are susceptible. De Soto and Victorgrain appear to be resistant. Most Red Rustproof strains are slightly susceptible, including Ferguson 922, Nortex, New Nortex, Appler, and selections from these. The winter Fulghums are also slightly susceptible. Lee, Curtis, and the Winter Turf group are highly resistant, and most Bond derivatives resistant, although one selection of a cross (Harry Culberson-Winter Fulghum × Bond-Iogold) × Mutica Ukraina was highly susceptible.

No evidence was obtained as to the introduction and transmission of the disease.

MCLAUGHLIN (J. H.). **Victoria blight of Oats; a dangerous new plant disease.**—*Circ. Okla. agric. Exp. Sta.* 127, 3 pp., 1 fig., 1948.

Although losses in oat yields due to *Helminthosporium victoriae* [*R.A.M.*, xxvii, pp. 313] have not yet been reported from Oklahoma, the disease is a serious potential threat. Growers are advised to use Oklahoma-grown certified seed harvested in 1947, preferably cleaned and treated. Seed treatment may give only partial control, however, when seed of a susceptible variety is planted in infested soil.

The spring oats Red Rustproof (Texas Red), Nortex, Fulton, and Kanota, and the winter oats Forkadeer, Tennex and Wintok are resistant to *H. victoriae* but susceptible to crown rust [*Puccinia coronata*]. Neosho is susceptible to *H. victoriae*

but resistant to crown rust and may be grown until blight becomes destructive in Oklahoma. All these varieties are adapted to growing conditions in Oklahoma.

LEUKEL (R. W.). **Relative effectiveness of certain fungicides as seed protectants and disinfectants.**—*Plant Dis. Reptr*, xxxi, 12, pp. 476–478, 1947. [Mimeographed.]

During 1947 further field tests were conducted in Maryland to determine the relative efficiency of various fungicides in controlling sorghum covered smut (*Sphacelotheca sorghi*) [*R.A.M.*, xxvii, p. 18] and their effects on emergence [ibid., xxv, p. 31]. The treatment of Sharon kafir, Leoti sorgo [*Sorghum saccharatum*], and Scarborough broom-corn [*S. bicolor* var. *technicus*] seed with new improved ceresan, ceresan M, ceresan M.S.F. (all at 0·5 oz. per bush.), spergon, phygon, arasan, and arasan S.F. (all at 2 oz.) gave significant increases in emergence over the untreated controls in all three varieties and controlled smut satisfactorily. Copper carbonate and 300-mesh sulphur (both at 2 oz.) controlled smut fairly well but failed to increase emergence significantly. The results indicated that none of the hitherto untested materials is a satisfactory substitute for new improved ceresan.

FAWCETT (H. S.). **Citrus diseases in the Lower Rio Grande Valley.**—*Calif. Citrogr.*, xxxiii, 8, pp. 362–363, 1948.

Investigations carried out in Lower Texas in March, 1948, showed that various strains of Texas red grapefruit, Marsh seedless, Thompson (Pink Marsh), and Foster Pink grapefruit, as well as sweet and mandarin oranges and tangelos were affected in varying percentages with four forms of psorosis [*R.A.M.*, xxvi, p. 298; xxvii, p. 129], namely, psorosis A, psorosis B, concave gum psorosis, and blind pocket psorosis.

While some trees in certain progeny orchards of all the commercially propagated strains of red grapefruit showed the virus infection, others appeared to be entirely free from it. The original source of the red grapefruit strains (four out of six of which were still available) also appeared healthy. The highest rate of infection in any red grapefruit orchard examined was 50 per cent.

The following programme for registration of stock free from psorosis is suggested: (1) selection of apparently healthy trees of good commercial qualities; (2) preliminary inspection of tree by a competent inspector for freedom from disease; (3) submission of tree to continued subsequent inspection; (4) budding from the tree under inspection in a special test nursery; (5) registering the tree if disease-free by the State Department of Agriculture; (6) planting out some of the progenies on special plots; (7) planting seed of each strain or variety submitted and selecting some seedlings for propagation. The requirements for this programme would involve a full-time inspector, a plant pathologist, a nursery for test seedlings, and a plot of 5 to 10 acres for planting out the progeny trees.

LEFÈVRE (P. C.). **De quelques plantes économiques, cultivées à la station expérimentale de Mulungu-Tshibinda (Kivu), et de leur résistance à leurs ennemis.** [On some economic plants grown at the experimental station of Mulungu-Tshibinda (Kivu), and their resistance to their enemies.]—*Publ. Inst. nat. Étude agron. Congo belge* (hors sér.), pp. 682–685, 1947.

Most of the information in this paper dealing with breeding work against coffee and potato diseases in the Belgian Congo has already been noticed from other sources [*R.A.M.*, xxvi, pp. 198, 199, 466].

PEARSON (E. O.). **The development of internal boll disease of Cotton in relation to time of infection.**—*Ann. appl. Biol.*, xxxiv, 4, pp. 527–545, 1 pl., 2 graphs, 1947.

Cotton internal boll disease (*Nematospora gossypii*, *N. coryli*, and related species) [*R.A.M.*, xxvi, pp. 235, 451], transmitted mainly by species of *Dysdercus*, is one

of the most serious and widely distributed diseases of this host. Investigations at Barberton, South Africa, in 1933 [ibid., xiv, p. 97], showed that the characteristic symptoms were less conspicuous in bolls six weeks old when inoculated with either *N. gossypii* or *N. phaseoli* than in those inoculated at four weeks [ibid., xiv, p. 97]. Studies from 1934 onwards demonstrated the relation between age of the bolls at the time of infection and the nature of the resultant damage [ibid., xiv, p. 358]. As the bolls reach their maximum size during the first four weeks of development, only damage occurring during that time can affect the final size of the boll. Growth of those inoculated when one or two weeks old was almost completely arrested; the bolls fell or aborted, the seeds were killed, and the lint was often reduced to a dark, papery membrane. Some of the effects noted were partly due to the water introduced with the inoculum. In bolls three and four weeks old when inoculated the lint was severely stained but not completely broken down; at maturity the carpels were open, but contorted and only partially reflexed; the centre of the lock was 'hard', the lint not expanding to separate all the seeds; while the most salient feature was 'webbing' due to the adhesion of the edges of the split carpels to strands of lint which stretched tightly across to the seeds. All these effects are ascribable to *Nematospora* alone. Inoculations at five, six, and seven weeks showed little, if any, effect on boll size and opening; the lint was not broken down and showed little or no 'webbing', but it was moderately stained, the extent and depth of the colour (dark brown to straw-yellow) decreasing with the age at which the inoculations were made. This type of boll produces the stained cotton of commerce. Bolls inoculated when eight or nine weeks old showed only traces of light discoloration and slight immaturity. Thus, the symptoms produced are identical with and covering the entire range of those occurring in cotton crops following attacks by the insect vectors.

In general *Nematospora* causes progressively less reduction in weight of seed cotton as the age of the bolls increases. The effect of inoculation on ginning outturn (lint as percentage of seed cotton), seed weight (gm. per 100 ginned seeds), and lint index (gm. lint per 100 seeds) became progressively less serious as the age of the boll at the time of inoculation increased. Lint index was affected relatively more than seed weight or ginning percentage during the first five weeks of boll life, whereas seed weight was not very greatly affected after five weeks although the germinating capacity of such seed (as measured by percentage water sinking seeds) did not approach normal until the eighth week.

There is close correlation between the moisture content of the developing lint and the degree of staining following infection.

The marked effect upon very young bolls of inoculations with sterile water was investigated experimentally. It was clearly demonstrated that the lethal effects observed were directly due to the water, such effect depending, for any given age of boll, on the quantity of water introduced.

Inoculations were made into bolls five weeks old using (1) a spore suspension of *N. gossypii*; (2) a toxic extract obtained by autoclaving half this spore suspension; (3) sterile distilled water. Separate locks of each boll were inoculated with 0·1 c.c. of each, the remaining locks being left as controls. Locks inoculated with living *N. gossypii* showed lint-staining on most seeds after six days, increasing in intensity after 14 days. The protoplasm appeared through the lint wall as a yellow-brown, coagulated granular mass broken into short cylinders. The seeds were unaffected except for brown spotting of the epidermis. Abundant hyphae and immature sporangia occurred throughout the lock after six days, but spores were not liberated until after 14. Sterile water inoculations caused only sparse specks of discoloration immediately below the puncture. The toxic extract induced a staining of the lint on the suture line and at the hair bases of up to half the seeds, but the effect diminished after 14 days.

To follow the progressive effects of the different inocula in bolls of different ages, samples of bagged bolls, two, four, and six weeks old, were separately inoculated with (1) a spore suspension; (2) a toxic extract; and (3) sterile distilled water. Each lock was inoculated with 0·2 c.c. The results demonstrated the profound effects of all the inocula on young bolls, the effects being greater, with growth more abruptly suspended, in the case of the living fungus than in that of sterile water, with the toxic extract occupying an intermediate position. In the bolls inoculated at four and six weeks, the immediate effects were much less severe, there being no significant difference between treatments after one week. But, whereas with the living spores the further growth of four-week-old bolls was arrested, there being no significant increase in lock weight between 7 and 21 days after inoculation, the sterile water and toxic extract had little or no effect, the locks continuing to make significant increases in weight.

Observations on young bolls punctured by uninfected stainers (*Dysdercus* spp.) and showing no trace of *Nematospora* or pathogenic bacteria demonstrated that the condition so caused is strikingly similar to that following sterile water inoculation but differs from that accompanying *Nematospora* infection chiefly in the much more localized effects (confined to seeds directly punctured) and in the limited staining of the lint. The staining and disorganization due to *Nematospora* in young bolls frequently extends far beyond the region where the fungus can be found, and failure to find *Nematospora* in severely affected bolls is not necessarily an indication that the damage has been directly caused by insect feeding.

It is concluded that if the variety grown has a high initial rate of flowering, and if sowing dates and conditions of cultivation are favourable, then the majority of bolls will pass through the susceptible phase before there are sufficient insect vectors to cause much damage.

White (R. T.). **Milky disease infecting Cyclocephala larvae in the field.**—*J. econ. Ent.*, xl, 6, pp. 912–914, 1947.

Besides the Japanese beetle (*Popillia japonica*), many other species of scarabaeid larvae are known to be susceptible to type-A milky disease (*Bacillus popilliae*) [*R.A.M.*, xxv, p. 393; xxvii, p. 19 and next abstract]. In this paper is presented a list of verified records of infected larvae of *Cyclocephala* collected in the field in Connecticut, Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, Virginia, and West Virginia. In the Mall area of Washington, at the beginning of September, 1941, some 17 per cent. of *C. borealis* larvae were found to be attacked by an atypical strain of type-A of *B. popilliae*, more recently designated the *Cyclocephala* strain. In October the disease rate was about 12 per cent., and by the following spring few larvae could be found, nor has more than an occasional specimen been observed since that date. The Japanese beetle in the same area was infected by the typical type-A strain of *B. popilliae*.

White (R. T.). **Application of milky-disease spore dust with a commercial fertilizer.**—*J. econ. Ent.*, xli, 1, pp. 113–114, 1948.

In an experiment in October, 1940, in the Mall area of Washington, D.C., satisfactory distribution of the spores of type-A milky disease (*Bacillus popilliae*) was effected by means of a tractor-drawn fertilizer spreader. Some 25,000,000 spores per sq. ft. were applied in this way to about an acre of turf in a strip 38 ft. wide, using a total of 24½ lb. spore dust containing over 45,000,000 spores per lb., thoroughly mixed with 400 lb. of a 10–6–4 commercial fertilizer. At the time of treatment the larval population in the soil averaged 44 per sq. ft. On 27th October, 1941, the average number of larvae per sq. ft. in the treated area was 7, of which 52 per cent. were milky, the corresponding figures for the untreated grass strips at each side of the plot being 11 and 1, respectively. From 26th to 30th October,

1942, the larvae in the treated area numbered on an average 2 per sq. ft., with 30 per cent. milky, the corresponding figures for the control strips being 4 and 10, respectively. A survey during the first week of June, 1943, revealed an average of only one larva per sq. ft., with one-third of the total population infected by *B. popilliae*, and subsequent observations continued to show small numbers of the beetle.

Brierley (P.) & Smith (F. F.). **Canna mosaic in the United States.**—*Phytopathology*, xxxviii, 3, pp. 230–234, 1 fig., 1948.

A mosaic disease affecting a number of *Canna* varieties observed in Washington, D.C., in 1942, the Brooklyn Botanic Garden in 1945, and in Michigan and Delaware nurseries in 1946 and 1947 is believed to be identical with the mosaic of *C. indica* previously reported from the Philippines [*R.A.M.*, xvii, p. 40]. A detailed experimental study of the disease in the same host and abaca (*Musa textilis*) was subsequently made by Ocfemia *et al.* [ibid., xxi, p. 491; xxvii, p. 236], who found that early foliar symptoms consist of fine, chlorotic lines connecting two branch veins, followed by the development of spindle-shaped, chlorotic areas; at advanced stages continuous or broken chlorotic stripes extend from the midrib to the margin parallel with the veins and the leaf may become wrinkled or curled. Such stripes tend eventually to turn brown and become necrotic, particularly in the ornamental varieties, while streaking of the petal colour occurred both in the latter and in *C. indica*. The disease was not seed-borne in *C. indica*. It was transmissible by *Aphis gossypii* and *A. maidis*, the former conveying the virus to *C. edulis*, *C. indica*, ornamental varieties, and *M. textilis*, but not to cotton or cucumber. The mode of transmission was non-persistent, the aphid acquiring the virus in five minutes' feeding on a source plant and becoming non-infective after feeding on one healthy plant or after one hour without food.

The writers' investigations, comprising material of *C. indica*, the ornamental Richard Wallace, and *C. glauca* (the last-named here reported as an additional host), largely confirmed the Philippine observations, the principal discrepancy being the failure of the United States virus to infect *M. textilis*. Transmission was effected by *Macrosiphum solanifolii*, *Myzus circumflexus*, and *M. persicae*, as well by *A. gossypii* and *A. maidis*, and also by leaf-rubbing. Evidence is presented of the immunity from *Canna* mosaic of the popular red-flowered ornamental variety, The President.

Muntañola (Maria). **La podredumbre del cuello del Gladiolo.** [The *Gladiolus* collar rot.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iv, 41, 14 pp., 3 pl. (1 col.), 1 fig., 1948.

The morphological and biochemical characters of the organism isolated from scabbed *Gladiolus* corms in Argentina corresponded with those of *Bacterium marginatum* [*R.A.M.*, xxvi, p. 59]. Inoculation experiments showed that wounds are not essential to the entry of the pathogen into the host, the stomata serving as portals of ingress. The incubation period ranged from three to five and eight to ten days in greenhouse and outdoor plants, respectively, while in the corms it extended to three or four weeks. The rapid spread of the disease, which is less destructive locally than fungal disorders, is promoted by high temperatures (round 33° C.), a humid atmosphere, and heavy, badly drained soils. *Bact. marginatum* is capable of overwintering in the dark scales of the corm, in the remnants of diseased leaves buried in the soil, and in the soil itself. Out of seven plants inoculated with a suspension of infected soil, four developed scab symptoms. Eight hours' immersion of Picardy corms in 1 per cent. hydroxymercurinitrophenol gave excellent control of *Bact. marginatum*, with 99 per cent. sound as against 40 in the untreated (diseased) controls, 98 in the healthy controls, 94 in the lot soaked for 12 hours

in 1 per cent. mercuric chloride, and 88 for a 7- to 10-minute dip in 1 per cent. acidulated mercuric chloride.

Frandsen (K. J.). **Studier over Sclerotinia trifoliorum Eriksson.** [Studies on *Sclerotinia trifoliorum* Eriksson.]—Thesis, Royal Veterinary and Agricultural College, Copenhagen, 222 pp., 99 figs., 3 diags., 6 graphs, 1 map, 1946. [Received February, 1948.]

This is a copiously amplified and tabulated version of the author's studies on clover rot (*Sclerotinia trifoliorum*) in Denmark, a preliminary account of which, embodying the salient features of the work, has already been published [*R.A.M.*, xxiii, p. 23]. The following supplementary information may be of interest. A list is given of 85 hosts of the fungus, based in part on Pape's compilation [ibid., xvii, p. 252], with additional records of more recent date. Plants found naturally infected in Denmark include lucerne, *Melilotus albus*, *M. officinalis*, *Ranunculus repens*, *Geranium dissectum*, *Plantago lanceolata*, *P. major*, *Myosotis arvensis*, *Taraxacum* sp., *Cirsium arvense*, *Matricaria inodora*, and *Anthemis arvensis* [cf. ibid., xv, p. 299]. *Lamium purpureum*, *Sonchus oleraceus*, *Arenaria serpyllifolia*, *Silene dichotoma*, and *Euphorbia helioscopia* were severely attacked in inoculation experiments. No evidence was obtained that *Sclerotinia trifoliorum* comprises races peculiar to the host species, but the results of infection experiments showed that isolates of the species often differ in virulence.

From a perusal of the monthly reports on clover rot submitted to the Lyngby Plant Pathology Experiment Station from 1919 to 1944 it appears that outbreaks occur principally during the period from October to May, with intermissions in frosty weather. The temperatures prevailing in November and December are decisive for the development of infection, which is arrested by relatively cool conditions and promoted by fairly mild weather at this juncture. During the 25-year period covered by the reports, attacks of *S. trifoliorum* assumed a particularly severe form in 1925, 1927, 1935, 1943, and 1944, when the mean temperatures in the previous November and December were 5·1° and 3·8° C., 5·6° and 2°, 5·9° and 5·1°, 4·9° and 3·3°, and 4·3° and 2·1°, respectively. At other times of year, when temperature does not limit the development of the pathogen, atmospheric humidity is an important factor. Björling has shown [ibid., xxii, p. 98] that a relative humidity of 90 per cent. is essential for satisfactory mycelial growth. In Denmark, as shown by Marke (Meterologi og Klimatologi, Copenhagen, 1934), the relative humidity generally ranges from 55 to 65 per cent. in June and July and rises to 90 per cent. in December and January, so that the predominance of clover rot from October to April conforms to expectation in this respect. However, in 1926, 1936, 1941, and 1943 severe attacks developed in May, when the relative humidity of the 'microclimate' immediately surrounding the plants was presumably much in excess of the atmospheric. Marke has shown that the air just above a meadow may be saturated with moisture even when the humidity at a height of 1 m. does not exceed 50 to 60 per cent. Neither in October to December nor in May could any correlation be established between precipitation and infection by *S. trifoliorum*. Of the 1,084 reports used in this 25-year analysis, 35 per cent. were concerned with more or less severe outbreaks of clover rot, involving the destruction of 20 per cent. and upwards of the stand and corresponding heavy reductions in yield.

Strains of red clover from the four Scandinavian countries showed variation in resistance, though as a rule there are no great differences. Øtofte Early proved to be the most resistant of seven Danish strains. Among the progeny of crosses between Early and Semi-late Øtofte red clover were some very resistant families, and progeny from these showed that all were more resistant than the semi-late strain and some were even more resistant than Early Øtofte. In further tests, the most resistant progeny family was descended from the most resistant parent

families, and while entirely immune plants have not been obtained it has been shown possible to raise the resistance to *S. trifoliorum* very considerably and the field experiments confirmed these results from infection experiments. The prospects of further improvement are regarded as promising.

Sprague (R.). **Gloeosporium decay in Gramineae.**—*Phytopathology*, xxxviii, 2, pp. 131–136, 1 fig., 1948.

A species of *Gloeosporium* producing pink masses of conidia on potato dextrose agar has been isolated from 121 species of cereals and grasses in North Dakota [*R.A.M.*, xxiv, p. 221; xxvii, p. 136] as well as from field material collected in Minnesota, South Dakota, Nebraska, Wyoming, Montana, and eastern Washington, and its distribution is thought to be probably far wider. The fungus has been the subject of further study in comparison with a carrot-red, mucose *Gloeosporium* that causes seed rot of various plants in sterilized soil [ibid., xxv, p. 563]. The pink conidial masses of the former fungus arise from pale cream-coloured colonies and on germination produce a black, smooth or wrinkled, carbonaceous growth or sometimes pycnidium-like stromata. On sterilized sand plus 0·85 per cent. bran and 0·5 per cent. dextrose the colonies are grey, cottony, and consist of true mycelium. Chlorinous chlamydospores, with somewhat reticulate inner walls, resembling those of *Fusarium oxysporum*, may also occur. The isolates producing carrot-red conidial masses tend to be somewhat slower than the pink ones in the formation of stromatic hyphae. A few isolates are of intermediate colour, while others again barely sporulate and are reminiscent of *Phoma* cultures.

In the dry season of 1947 *Gloeosporium* was represented in only 1 per cent. of the isolates from grass roots at the Washington State College, as against 919 (4 per cent.) of the total of 22,832 cultures of all isolates up to 1943 and 6·7, 14, and 26 per cent. in 1944, 1945, and 1946, respectively [loc. cit.].

The results of soil inoculation experiments with the pink and carrot-red strains of *Gloeosporium* in the greenhouse at Mandan, North Dakota, from 1941 to 1946 were very erratic. Seven tests with the pink isolates showed that two were parasitic, two doubtful, and three non-pathogenic, the corresponding figures for the carrot-red being five (including three reisolates), one, and two, respectively. One of the parasitic pink isolates (from timothy [*Phleum pratense*]) caused 100 per cent. loss of lucerne, 50 of Canada bluegrass [*Poa compressa*], 32 of maize, 93 of blue grama [*Bouteloua oligostachya*], 13 of oats, 98 of Turghai proso [*Panicum miliaceum*], 24 of Amber sorghum, and 65 each of wheat and crested wheatgrass [*Agropyron cristatum*], while the corresponding figures for the other (from *A. cristatum*) were 100, 5, 6, 64, 0, 55, 40, trace, and 10, respectively. A carrot-red isolate from *Elymus excelsus* caused 96 per cent. loss of lucerne, 50 of field beans [*Phaseolus vulgaris*], 29 of garden beets, 2 of Kentucky bluegrass [*Poa pratensis*], 92 of Chinese cabbage, trace of maize, 40 of *B. oligostachya*, 78 of pigeon grass [*Setaria viridis*], 29 of *Hordeum brevisubulatum*, 5 of oats, 68 of *Panicum miliaceum*, 1 of vegetable marrow, 7 of sorghum, 20 of Rosana tomato, 28 of wheat, 32 of *A. cristatum*, and 30 of intermediate wheat grass [*A. intermedium*]; a second carrot-red strain, from *A. intermedium*, caused percentage losses of 26, 12, 9, 82, trace, 8, 6, 2, trace, 16, 35, trace, 50, 4, and 14 in lucerne, bean, *Poa pratensis*, cabbage, maize, *B. oligostachya*, *S. viridis*, *H. brevisubulatum*, oats, *Panicum miliaceum*, vegetable marrow sorghum, tomato, wheat, and *A. cristatum*. It would appear from these data that the strains of both colours are facultative, but seldom active parasites on seeds, being commonly isolated from plants growing in cool, wet, or nitrogen-deficient soil, or in crowded volunteer stands.

The conidia of both the pink and carrot-red strains are apparently identical, though old, semi-vacuolated spores of the former show a stronger tendency to inflation than those of the latter. The conidia are hyaline, uni- to quadriguttulate,

averaging 4 to 9 by 1·7 to 3μ but attaining a width of 4μ or more in cases of extreme distension. The species is quite distinct from the two others described on Gramineae, both by Rostrup from Denmark (*Bot. Tidsskr.*, xviii, pp. 65–78, 1892) and is accordingly named *G. bolleyi* n. sp., H. L. Bolley having apparently observed it in North Dakota as early as 1913 (*Bull. N. Dak. agric. Exp. Sta.* 107).

Kreitlow (K. W.). **Urocystis agropyri on Phleum pratense.**—*Phytopathology*, xxxviii, 2, pp. 158–159, 1948.

Stripe smut of timothy (*Phleum pratense*) in the north-eastern United States is usually caused by *Ustilago striiformis* [*R.A.M.*, xxvii, p. 136], but the smut collected on this host by the author and Cassell in 1944 (*Plant Dis. Reptr*, xxix, p. 365, 1945), while macroscopically indistinguishable from *U. striiformis*, was shown by microscopic examination to consist of spore balls resembling those of *Urocystis agropyri* [*R.A.M.*, xxiii, pp. 57, 170; xxv, p. 364]. No previous record of this smut on *P. pratense* could be traced.

The identical symptoms of the two diseases suggested that some specimens of timothy macroscopically diagnosed as infected by *Ustilago striiformis* might actually be attacked by *Urocystis agropyri*. However, all but one of the plants collected in several north-eastern States in 1946 were found to harbour *Ustilago striiformis*, the single collection infected by *Urocystis agropyri* originating in New Hampshire. The latter smut did not figure at all among the collections made in 1947. The total number of specimens collected for two years was 26.

The two samples of *U. agropyri* on timothy were collected about 75 miles apart. In this connexion attention is drawn to another specimen of *U. agropyri* collected on the same host by C. Drechsler in Missouri in 1917, the spores of which were found to be comparable to those of the Vermont and New Hampshire samples.

In size, shape, colour, and so forth the spore balls of the timothy smut resembled those of *U. agropyri* from other species of grasses. A predominance of single-spored balls, however, was noted by Dr. G. W. Fischer, who verified the identification of the smut in a personal communication. Attempts to induce spore germination were unsuccessful.

Decker (P.). **Anthracnose of Blue Lupine is seed borne.**—*Plant Dis. Reptr*, xxxi, 12, p. 486, 1947. [Mimeographed.]

Anthracnose of blue lupin (*Lupinus angustifolius*) [cf. *R.A.M.*, xxvi, p. 548] caused by *Glomerella cingulata* [ibid., xxii, p. 299] was very prevalent in parts of southern Alabama, Georgia, and north-west Florida during 1947. When infected seeds were planted in the greenhouse, of the 40 per cent. which germinated, approximately 30 per cent. grew into normal plants and the remaining 10 per cent. bore typical anthracnose lesions on the leaves and stem.

Little (J. E.), Sproston (T. J.), & Foote (M. W.). **Isolation and antifungal action of naturally occurring 2-methoxy-1,4-naphthoquinone.**—*J. biol. Chem.*, clxxiv, 1, pp. 335–342, 1 graph, 1948.

The existence of 2-methoxy-1, 4-napththoquinone in plant cells was established by its isolation from *Impatiens balsamina* at the Vermont Agricultural College. LD_{50} values and dosage-response curves were obtained by standard procedures [*R.A.M.*, xxvi, p. 497] using *Sclerotinia fructicola* as the test organism. The substance was shown to be non-toxic to young tomato and bean [*Phaseolus vulgaris*] plants at concentrations two or three times its LD_{50} value. The zone sizes (in mm.) obtained in tests for anti-fungal activity were: *S. fructicola* 32, *Colletotrichum lindemuthianum* 31·3, *Aspergillus niger* 18, *Penicillium notatum* 39·2, *Pythium debaryanum* 16, and *Trichophyton mentagrophytes* and *Ustilago avenae* 0. The compound is considered to offer some promise as a fungicide.

Smock (R. M.). **The 'spot' disease of Northern Spy Apples.**—*Proc. Amer. Soc. hort. Sci.*, 1, pp. 95–99, 1 fig., 1947.

Northern Spy apples in storage in New York are subject to a spot disease [*R.A.M.*, xxiv, p. 21] occurring on the red portion of the fruit (very rarely on the yellow), exposed fruits from the outer part of the tree and those picked late being especially affected. It resembles Jonathan spot [ibid., xxii, p. 100; xxiv, p. 139], though the symptoms are not identical.

In air storage a temperature of 40° F. was more conducive to the development of the disorder than 32°, but controlled atmosphere storage (5 or 10 per cent. carbon dioxide with 2 per cent. oxygen) [see next abstracts] at 40° prevented the disorder and lengthened the storage life of the fruit (as compared to the usual storage in air at 32°). The use of 10 per cent. carbon dioxide and 2 per cent. oxygen at 32° controlled the condition, but considerable brown heart [ibid., xxv, p. 122] developed.

Smock (R. M.). **Some requirements of McIntosh Apples in controlled atmosphere storage.**—*Proc. Amer. Soc. hort. Sci.*, 1, pp. 109–114, 1947.

Experimental evidence is presented showing that scald [*R.A.M.*, xxvi, p. 496; xxvii, p. 137] of McIntosh apples grown in New York State was effectively prevented during the 1946–7 season in controlled atmosphere storage (5 per cent. carbon dioxide, 2 to 3 per cent. oxygen at 40° F.) [see preceding abstract] by air purification, the atmosphere being circulated through 80 gm. activated coco-nut shell carbon [ibid., xxv, p. 507]. The fruit thus treated showed only 1·7 per cent. scald, the control 28·2. Another scald-reducing factor is a rapid rate of oxygen decrease, 46·29 per cent. scalded Rhode Island Greening resulting when 12 per cent. oxygen content was reached in one week, against 98·44 when it took four weeks. The figures for McIntosh were 1 per cent. scald for a two-week and 50 for a four-week drop in oxygen content. A rapid drop is achieved by having full and gas-tight rooms.

Decay caused by skin punctures is not prevented, though it may be reduced, in controlled atmosphere storage.

Lin (K-H.). **The effect of modified air on the rotting of Apples in storage.**—*Lingnan Sci. J.*, xxii, 1–4, pp. 133–138, 1 graph, 1948.

In this study, the subject of a thesis of Cornell University, part of which has already been published [*R.A.M.*, xxi, p. 337], it is stated that McIntosh and Delicious apples inoculated with *Penicillium expansum*, *Lambertella corni-maris* [ibid., xxii, p. 455], *Sclerotinia fructicola* [see next abstract], or *S. nipponica* rotted significantly faster in ordinary air at 40° F. than in a modified atmosphere containing 5 per cent. carbon dioxide, 2 per cent. oxygen, and 93 per cent. nitrogen at the same temperature [cf. preceding abstracts]. In another test this air mixture and another containing 10, 11, and 79 per cent. of the same gases, respectively, at 40° were about equally effective in inhibiting the rotting due to *S. fructicola*, *P. expansum*, and *Botrytis cinerea* in the McIntosh. The rate of rotting, however, in inoculated McIntosh apples was slowest in ordinary air at 32°. It is concluded that both low temperatures and modified air with higher carbon dioxide and lower oxygen contents have retarding effects on fungal apple rots.

Lin (K-H.). **Enzyme and toxic substance production by Apple rotting fungi.**—*Lingnan Sci. J.*, xxii, 1–4, pp. 139–142, 1948.

Based on the results of experiments in which the juice of apples rotted by the test fungi was used to macerate potato, carrot, and apple disks, the author suggests that saprophytic plant pathogens fall into two groups with respect to the mechanism

of their invasion of plant tissues. One includes *Penicillium expansum* and *Sclerotinia fructicola* [see preceding abstract], which secrete large quantities of protopectinase, causing the dissolution of the middle lamella; they produce few or no toxic substances. The other is represented by *Physalospora malorum* [*P. mutila*], *Lambertella corni-maris*, and *Glomerella cingulata*, which produce a powerful toxic substance to kill the plant cell, but secrete little or no protopectinase. The thermostability of the toxic substance suggests that it is probably not enzymic.

Junière (P.). **The storage of Apples and Pears.**—*Rev. Alumin.*, xxiii, p. 161, 1946. [French. Translation in *Light Metals*, x, 113, pp. 278-283, 1 col. pl., 4 figs., 1947.]

Three apple varieties, Canadian, Le Mans, and Clochard Reinettes, were selected for experiments in the Angers district of France to determine the value of aluminium-foil wraps in the prevention of transit and storage disorders. The wrapped fruit showed a markedly reduced loss of weight over the unwrapped, amounting to 5·6 and 19·5 per cent. by weight, respectively, in the Clochard Reinettes over the storage period from 30th September to 4th April, while the total reductions from decay were 27·5 and 78 per cent., respectively.

Blumer (S.) & Zach (C.). **Die Verwendung von Netzschwefelpräparaten im Obstbau.** [The utilization of wettable sulphur preparations in fruit-growing.]—*Schweiz. Z. Obst- u. Weinb.*, lvii, 6, pp. 91–94; 7, pp. 111–114, 1948.

The results of laboratory tests showed considerable differences in the tenacity of four wettable sulphurs as compared with lime-sulphur, the fungicide mainly used in Switzerland for apple scab [*Venturia inaequalis*] control. The disease was of little importance in 1947 and data relating to the relative value of the wettable sulphur and standard lime-sulphur schedule could only be obtained on the Boiken variety in one locality and on Gravenstein in another. All four wettable sulphurs proved superior to lime-sulphur on the latter variety, whereas in the case of the former the position was reversed. The incidence of powdery mildew [*Podosphaera leucotricha*], which has been very troublesome in the recent dry seasons [*R.A.M.*, xxvii, p. 273], was reduced to a half to one-fifth of that of the untreated controls by two to three pre-floral and the usual post-blossom applications with the wettable sulphurs on the highly susceptible Jonathan variety, but Boiken responded equally well, if not better, to lime-sulphur.

Under Swiss conditions the apple varieties sensitive to lime-sulphur, e.g., Berner Rosen, Danziger Kant, Sauergrech, and Winterzitrone, appear to be equally so to the wettable brands, which were responsible for severe leaf scorch and defoliation [cf. ibid., xxvi, p. 549]. No advantage would result, therefore, from the substitution of wettable sulphurs for lime-sulphur on such varieties. Of the four wettable sulphurs provisionally approved on the basis of these experiments, only two are as yet on the market, namely thiovit (Sandoz) and Haftschwefel (Ciba/Maag).

Kidson (Elsa B.). **Variation in magnesium and potassium content of individual leaves from mineral-deficient Apple shoots.**—*J. Pomol.*, xxiii, 3-4, pp. 178–184, 2 graphs, 1947.

Continuing her studies on the mineral contents of apple leaves [*R.A.M.*, xxvi, p. 342] at the Cawthron Institute, New Zealand, the author examined individual leaves from a number of leaders, some from trees showing mineral deficiencies and some from symptomless trees. Leaf scorch occurred on the Jonathan and Sturmer varieties, in April, 1941, where the magnesium oxide content ranged from 0·05 to 0·16 per cent. The magnesium content of the leaves of all leaders gradually increased towards the top of the shoot. Because of this variation a consistent sampling method is recommended and it is suggested that leaves from the lower

half of the shoot collected in December or early January may best serve the purpose under New Zealand conditions.

Leaves from two apparently normal Cox's Orange leaders collected in late February or early March, 1944, showed that for over more than half their length the magnesium oxide content was less than 0·4 per cent., a figure given as critical by Wallace [ibid., xix, p. 605].

The leaves of potassium-deficient leaders of Cox's Orange and Sturmer contained less than 0·8 per cent. potassium oxide. The potassium content of two apparently normal Cox's Orange leaders was more than twice that of potassium-deficient ones, while for the leaves of a magnesium-deficient leader it was considerably higher than for normal leaves.

Moore (M. H.). **Improving the field performance of standard protective fungicides. II. The use of ferrous sulphate to diminish spray damage on Apple.**—*J. Pomol.*, xxiii, 3–4, pp. 139–148, 1947.

Spraying tests were conducted at East Malling from 1935 to 1938 on young trees to determine whether the addition of ferrous sulphate would obviate the phytotoxicity of lime-sulphur.

In 1935, using lime-sulphur 1–40 and 1–60 with and without ferrous sulphate (4 lb. per gal. concentrated spray), effective control of apple scab [*Venturia inaequalis*: *R.A.M.*, xxv, pp. 348, 456] on the leaves of Cox's Orange and Worcester Pearmain was obtained (0+ on a scale of 0 to 5), while the infection rate of unsprayed foliage was 4·4 and 3·7 for Cox, 3 and 2·6 for Worcester. Leaf and fruit drop were lessened somewhat but not prevented by the addition of ferrous sulphate. In 1936 the disease was practically absent except on the controls. Fruit drop and defoliation were severe but less with ferrous sulphate.

Results obtained in further trials showed that ferrous sulphate failed substantially to prevent fruit drop, even with lime-sulphur at 1–100, though a slight mitigation on Cox was observed.

It is concluded that although the addition of ferrous sulphate to lime-sulphur prevented much early leaf drop on Cox's Orange Pippin and Worcester Pearmain, the fruit drop was not sufficiently arrested to justify its commercial use. The fungicidal efficiency of lime-sulphur was not impaired by the inclusion of ferrous sulphate, either alone or with arsenate.

Lime-sulphur (1–60) applied post-blossom was equally phytotoxic with or without lead arsenate. Used alone at 1–100 it caused only slight early leaf drop on Cox, which became severe, however, when lead arsenate was combined. Fruit drop was severe at either dilution (except on Worcester at 1–100) alone or with arsenate and was only slightly mitigated by ferrous sulphate.

Data obtained in the tests and a long experience emphasize that the second post-blossom spray causes nearly all the injury and that in many parts of south-east England cropping Cox's Orange Pippin and several other varieties do not tolerate lime-sulphur (even at 1–100) applied in June. To avoid damage a higher dilution without arsenate should be used or the spray omitted altogether at that period.

Marsh (R. W.). **Fruit spraying trials with certain recently-introduced fungicides.**—*J. Pomol.*, xxiii, 3–4, pp. 185–205, 1 fig., 1947.

The author, after reviewing recent research on the use of some dithiocarbamates, organic mercurials, substituted quinones and quinolines, and glyoxalidine derivatives as protectant sprays on deciduous fruit plants, summarizes the results of field trials carried out from 1944 to 1947 at Long Ashton and in Worcestershire [*R.A.M.*, xxvi, p. 63] with some of these new fungicides, and also with tetrachlornitrobenzene (folosan DB 905) [ibid., xxiv, p. 103] and salicylanilide (shirlan) [ibid.,

xxvi, p. 375]. The trials were made principally on apples for the control of scab (*Venturia inaequalis*) [see preceding abstract] and on black currants against leaf spot (*Pseudopeziza ribis*) [ibid., xxv, p. 2]. Some trials were made for the control of brown rot of apples and plums (*Monilia* [*Sclerotinia*] *fructigena*) [and *S. laxa*: ibid., xxv, p. 1] and one spray damage test was made on gooseberries. The field performances of the fungicides against *P. ribis* were evaluated by eye-estimations of the degree of foliage retention per bush in the late summer, using an arbitrary scale of 0 to 10. The mean value for each treatment in each randomized block was expressed as a percentage foliage retention. For apple scab the mean percentage scabbed area per leaf was estimated by Kearns's method [ibid., xxvi, p. 63], and an extension of this for fruit counts, introduced in 1947, is described.

The results of tests for scab control on Worcester Pearmain showed that in 1946 mercurated arsenate (2·5 per cent. phenyl mercury chloride precipitated on lead arsenate at 2 lb. to 100 gals. water plus sulphite lye wetter) [cf. ibid., xxiii, p. 2] and in 1947, undiluted 2-heptadecylglyoxalidine (341) and 1 per cent. hydroxyethylheptadecylglyoxalidine (337) were equal to standard lime-sulphur. No spray damage was caused to Lane's Prince Albert and Stirling Castle (specially sensitive varieties) by 1 per cent. 8-hydroxyquinoline sulphate plus 4 oz. hydrated lime or by the glyoxalidine preparations 341A, 341B, and 341C (all at 1 to 100). The safety of these fungicides was confirmed on Leveller gooseberries, which also showed no injury.

Overwintered mummied plum fruits were sprayed in December, 1946, with a mixture composed of 3 gm. phenyl mercury chloride and 75 c.c. 66 per cent. grade E oil emulsion plus sulphite lye in 1 l. water. The treated plums were left on the trees until 2nd June, when three out of 36 produced sporing pustules of *S. fructigena*.

In the 1946 trials against black-currant leaf spot the mean percentage foliage retentions were for 46 per cent. tetramethylthiuram disulphide (4 to 100) 75, 2 per cent. ferric dimethyldithiocarbamate 71, 2 per cent. zinc dimethyldithiocarbamate 81, and the unsprayed 60 per cent. The 1947 trial showed that phygon (1 lb. 98 per cent. dichloronaphthoquinone per 100 gals. plus sulphite lye), glyoxalidine (1 to 100), and dithane D 14 zinc sulphate lime ($\frac{1}{2}$–1–$\frac{1}{2}$–100) gave equal control of *P. ribis*, with over 60 per cent. foliage retention against 26 for the unsprayed.

All these preparations are used at concentrations much lower than for lime-sulphur and therefore possess advantages in storage and transport, but they would probably be too costly at present for commercial use. The fungicides based on phenyl mercury chloride are as effective for apple scab control as lime-sulphur. Mercurated arsenate was found to be non-phytocidal. Hydroxyquinoline sulphate exhibited no fungicidal value. The limited tests with the glyoxalidine sprays (at 1–100) during a dry summer showed them to be as effective as standard lime-sulphur and caused no injury even on sulphur-sensitive varieties. Thus it seems that it may be possible to replace lime-sulphur in the control of apple scab.

P. ribis, which was in general more sensitive to fungicides than *V. inaequalis*, was effectively controlled by the materials of the thiocarbamate groups at 2 lb. per 100 gals. Tetramethylthiuram disulphide was successful only in 1946. Heptadecylglyoxalidine and dichloronaphthoquinone also gave satisfactory field control of the fungus.

Dupias (G.). **Étude expérimentale d'Urédinées hétéroxènes.** [Experimental study of heteroecious Uredinales.]—*Bull. Soc. Hist. nat. Toulouse*, lxxxi, pp. 75–80, 1946 (issued 1947).

Particulars are given of cross-inoculation experiments with some heteroecious rusts of the Toulouse region, including *Gymnosporangium clavariiforme* [*R.A.M.*, xvii, p. 704], the teleutospores of which from juniper were deposited on *Crataegus*

monogyna and pear leaves. The former host contracted severe foliar and floral infection and aecidia were produced in abundance on the flowers, especially the ovaries. The latter host, however, bore only a few spermogonia and no aecidia developed. Natural infection of the pear, therefore, may evidently occur, but in so mild a form as to be readily overlooked.

Nicolas (G.). **Observations sur Tranzschelia pruni-spinosae.** [Observations on *Tranzschelia pruni-spinosae.*]—*Bull. Soc. Hist. nat. Toulouse*, lxxx, pp. 170–176, 1945 (issued 1946).

A number of outstanding contributions to the literature on the rust of stone fruits caused by *Tranzschelia* [*Puccinia*] *pruni-spinosae* are summarized and discussed, with special reference to observations on the development of the pathogen in the vicinity of Toulouse.

Thomas (H[arold] E.), Thomas (H. Earl), Roberts (Catherine), & Amstutz (A.). **Rootstock susceptibility to Armillaria mellea.**—*Phytopathology*, xxxviii, 2, pp. 152–154, 1948.

With a view to the discovery of a rootstock for apricot and prune resistant to *Armillaria mellea* in the Santa Clara Valley, California [*R.A.M.*, xxiv, p. 453], 18 lots of 37 to 40 plum roots, mostly myrobalan [*Prunus cerasifera*] and Marianna types, were planted at the Deciduous Fruit Field Station, San José, in 1928. All were repeatedly inoculated near the crown with wood from pure cultures of the pathogen, drastically pruned, and about half heavily cut back in the second and fourth years from planting to stimulate the usual procedure of top-working in orchards. Notwithstanding this severe treatment, however, only 54 of the total of 714 trees succumbed during the first nine years of the experiment. Of the 431 trees surviving in 1945, none passed the highest standard in a scale from 0 (no infection) to 10 (complete girdling of the crown and most or all of the roots dead), and only three qualified for inclusion in class 1, one of which had to be discarded on account of crown gall [*Bacterium tumefaciens*]. Attempts are in progress to develop new clones for further tests from the two remaining trees, one being Marianna 2624, with an average infection grade of 6·7.

In 1946 a number of other types of fruit and nut rootstocks, some planted two years later than the plums, were uprooted and rated for infection by *A. mellea*. The Kadota fig was the most resistant (0·1), followed by *Diospyros virginiana* (0·13), Black Mission fig (0·25), *Castanea dentata* (0·74), Northern Californian black walnut (*Juglans hindsii*) (0·77), Japanese persimmon (0·85), Spanish chestnut (0·86), *D. lotus* (0·88), common cultivated pear and Red Delicious apple seedlings (1·04), cultivated apple (French Crab) seedlings (1·1), *Pyrus calleryana* (1·9), and *P. betulaefolia* (2·93). The wide differences in the incidence of infection between individual trees in the several lots emphasize the desirability of using only single clones propagated by root or stem cuttings in varietal reaction trials.

Mader (E. O.) & Feldman (A. W.). **Physiological exhaustion of Strawberry plants as a factor in winter killing.**—*Phytopathology*, xxxviii, 2, pp. 137–141, 1948.

In an investigation at the Minnesota Agricultural Experiment Station of the possible role of fluctuating temperatures in the predisposition of strawberry plants to winter-killing through physiological changes or infection by soil fungi, field-grown, current-season Senator Dunlaps were obtained on 21st October (series 1) and 15th November (series 2), 1946. All those of the former and part of the latter were immersed in a suspension of sand–maize meal cultures of a pathogenic *Fusarium* [*R.A.M.*, xxvi, p. 400] and wrapped in moist sphagnum moss before storage at a constant temperature of 3° C. or the same alternating with —3° for 12, 14, or 24 days. After each storage period five plants were selected at random for

analyses of total sugars and starch, the remainder being planted in sterilized soil in a greenhouse at 16·5°, where they received 14 hours of light daily.

There was more sugar in the roots and tops of plants subjected to alternate freezing and thawing for 12 and 14 days than in those held at a constant temperature. After 24 days the sugar contents of the entire plants were approximately the same as after 12 at a constant temperature, but under fluctuating conditions the sugar content of both roots and tops was lower after 24 than after 12 days' storage. The starch content decreased very rapidly in the roots and rather slowly in the tops as the storage period advanced, and was lower in the plants subjected to fluctuating temperatures than in those maintained constantly at 3°. Plants of series (2), with a vigorous crown growth when placed in storage, contained more total sugar and starch in roots and tops after 24 days' storage than those of series (1) stored for 14 days.

Strawberry plants stored at a constant temperature survived better than those exposed to fluctuations, 60 per cent. of a lot of series (1), for instance, being dead 36 days after removal from storage under the latter conditions compared with 17 per cent. under the former. Inoculation with the pathogenic *Fusarium* did not increase the mortality of the stored plants by more than about 10 per cent.

When temperatures fall below 4·5° carbohydrates are transformed in many plants and this is followed by increased respiration. Under the conditions of these tests carbohydrate conversion was apparent in plants stored at 3° but was more pronounced at the fluctuating temperatures. The decrease of starch, and more especially that of sugar, in the plants held for 24 days at 3° alternating with −3° suggests that the increased respiration associated with carbohydrate conversion accounted for their physiological exhaustion and subsequent death. Soil-inhabiting pathogens may also contribute to the killing of the plants. Any methods that increase the carbohydrate reserve in the strawberry plants will reduce the probability of losses from winter-killing.

Thomas (H[arold] E.) & Goldsmith (E. V.). **The Shasta, Sierra, Lassen, Tahoe and Donner Strawberries.**—*Bull. Calif. agric. Exp. Sta.* 690, 12 pp., 2 figs., 1945. [Received March, 1948.]

Through re-crossing desirable selections originating from crosses between *Fragaria chiloensis* and various other strawberry varieties which showed considerable resistance to yellows [strawberry yellow edge virus: *R.A.M.*, xxv, p. 38], the authors obtained several resistant selections with good market qualities.

Among the new varieties Shasta is fairly resistant to mildew [*Sphaerotheca humuli*: ibid., xxv, p. 385] and slightly so to *Verticillium* wilt [*V. albo-atrum*: ibid., xxi, p. 340; xxiv, p. 423; xxvi, p. 400]; Sierra is moderately resistant to yellow edge; Lassen showed a marked resistance to yellow edge, but is very susceptible to *V. albo-atrum* and moderately so to mildew; Tahoe is fairly resistant to *V. albo-atrum* and yellow edge, while Donner is resistant to mildew but susceptible to yellow edge and highly so to *V. albo-atrum*.

Waldo (G. F.), Darrow (G. M.), Jeffers (W. F.), Demaree (J. B.), & Meader (E. M.). **Breeding Strawberries for resistance to red stele root disease.**—*Proc. Amer. Soc. hort. Sci.*, xlix, pp. 219–220, 1947.

Three methods are being used for selecting strawberries resistant to red stele [red core (*Phytophthora fragariae*): *R.A.M.*, xxvii, p. 122]; (1) at the Maryland Agricultural Experiment Station, Pittsville, and at Beltsville, some 38,000 seedlings were planted directly in infested soil and the uninfected ones retested: one selection, U.S. 3205, is being propagated for distribution; (2) about 11,000 seedlings were grown in pots in the greenhouse and each pot infected with cultures of *P. fragariae*, the uninfected seedlings being transplanted into infested soil; (3) in

Oregon 24,633 seedlings have been grown since 1943 in infested soil in greenhouse benches, and also 54,000 in Maryland since 1944. This method is recommended as the most economical and most rapid for obtaining commercially resistant varieties.

Many progenies were 100 per cent. infected even when one parent was resistant. In Maryland the Aberdeen variety and two selections having a Scottish resistant selection as one parent are sources of high resistance. In Oregon Aberdeen and some selections of *Fragaria chiloensis* and of Oregon Nos. 1509, 1775, and 1491 were resistant, though 1509 and 1775 proved susceptible in Maryland, where the disease has been more virulent and the tests more severe, possibly because of different strains of the fungus.

Anderson (H. W.). **Strawberry fruit rots and their control.**—*Trans. hort. soc. sth. Ill., 1946*, pp. 239–243, [? 1947].

During 1946 strawberry-growers in southern Illinois reported an unusual amount of fruit rot, losses in some cases amounting to 50 per cent. of the crop. Four forms of fruit rot are common locally, grey mould (*Botrytis cinerea*) [*R.A.M.*, xxiv, p. 423; xxvi, p. 205], leak (*Rhizopus nigricans*) [*R. stolonifer*: ibid., xix, p. 26], leathery rot (*Phytophthora cactorum*) [ibid., xxv, p. 329], and a black rot caused by the *Rhizoctonia* producing black scurf of potatoes [*Corticium solani*: ibid., xxv, p. 70]. The disease which caused concern in 1946 was grey mould. This, though ubiquitous locally, is entirely dependent on the weather, since it does not fruit except in moist conditions. Spread is somewhat slow and in many cases only a few well-shaded clusters of fruit in the middle of a dense row are attacked. The prevailing weather was very wet during the development and ripening of the fruit.

The control of grey mould lies in strict sanitation. The beds should be covered with a light mulch which can be raked off in spring and serves as an aerated blanket under the fruit clusters. The rows should be narrow and the plants thinned out to allow free circulation of air. The pickers should be trained to recognize fruits in the early stage of infection and warned not to pick fruits with a withered calyx, as these spread infection in packing and transit. Rotted fruit should be picked and placed on the mulch between the rows, where it will soon dry up. In the packing shed growers should pan-grade the fruit and discard all affected berries. The first sign of the rot is often a dull, discoloured, somewhat indistinct spot. Graders should also look for withered calyces. Generally very little further infection occurs in well-graded fruit promptly marketed. Most of the grey mould that occurs in transit and in the market originates in the field.

It is not true that *R. stolonifer* follows rotting by *B. cinerea*. Berries seldom show both fungi and there seems, in fact, to be some antagonism between them. Although there is not much difference between varieties as regards susceptibility to *B. cinerea*, growth habit affects considerably the amount of grey mould that develops. Varieties with long, stiff stems, which carry the flowers above the leaves, escape infection, whereas those with long leaf petioles are undesirable. It is doubtful, however, whether it is worth while changing established varieties on account of fruit rot.

Jeffers (W. F.) & Woods (M. W.). **Field studies on spread of the mild streak disease of Black Raspberries.**—*Phytopathology*, xxxviii, 3, pp. 222–226, 1 fig., 1948.

Mild streak, apparently caused by a virus, is the most serious disease affecting black raspberry plantings [*R.A.M.*, xx, p. 26] in Maryland. First observed in 1935, it has spread to nearly all plantings in the State. In a planting of the Cumberland variety the incidence of infection rose progressively from 1·5 per cent. in 1942 to 91·3 in 1947. In 1943, when 22·6 per cent. of the plants were infected, roguing was discontinued. The symptoms of current-season infection are not easily recogniz-

able. The rapid spread of mild streak may be related to the distribution of an insect vector and the proximity of brambles. The most prevalent of the aphids in the test planting was *Amphorophora sensoriata*, transmission experiments with which are in progress. Of a number of other insects collected in sweepings, only *Cercosipha rubifolii* is known to feed on *Rubus*.

McKnight (T.). **Losses from water blister can be avoided.**— *Qd agric. J.*, lxiii, 6, p. 347, 1946. [Received April, 1948.]

In order to avoid losses in transit of pineapples from water blister [*Ceratostomella paradoxa*: *R.A.M.*, xxv, p. 509], growers are advised to destroy any possible breeding material for the fungus in and around the packing-sheds by thoroughly spraying with 5 per cent. formalin before the summer crop begins to ripen. Floors which cannot be kept free from infective material should also be sprayed at regular intervals. Injured fruits should be discarded before packing.

Chester (K. S.). **Plant protection mutates.**—*Sci. Mon., N.Y.*, lxvi, 2, pp. 157–159, 1948.

This is an interesting review of recent developments in the United States in the preparation and application of fungicides for the protection of crops against disease and of fabrics and other organic materials from microbiological destruction.

Chester (K. S.). **The nature and prevention of plant diseases. Second Edition.**— xi+525 pp., 216 figs., 3 diags., 5 graphs, Philadelphia, The Blakiston Company, 1947. $4·50.

In the second edition of this treatise [cf. *R.A.M.*, xxii, p. 321] numerous important diseases not included in the first edition or only briefly described have been given more detailed treatment and the chapter on virus diseases has been completely rearranged. The discussions of seed treatment and spraying and dusting of fruits and vegetables have been extensively revised and attention is given to the latest developments in control practices, including the slurry, pelleting, and vapour-heat methods of seed treatment, the new non-metallic organic fungicides, and innovations in spraying and dusting methods. A number of references and a glossary of common mycological terms used in the book have been added.

Ferraris (T.). **Patalogia e terapia vegetale. Volume primo. Generalità e malattie crittogamiche. Tomo I. Patologia generale e fitoiatria.** [Plant pathology and therapy. First volume. General considerations and fungal diseases. Tome I. General pathology and 'phytoiatria.']—Fifth, completely revised, Edition, ix+707 pp., 2 col. pl., 70 figs., 40 graphs, 1 map. Milan, Ulrico Hoepli, 1948. L. 2,200.

The fifth edition of Ferraris's well-known work [*R.A.M.*, vii, p. 43], completely revised by R. Ciferri and E. Baldacci, is to consist of two main volumes, of which the first is divided into two books dealing, respectively, with (a) general pathology and 'phytoiatria' (or the principles and practice of plant disease control), and (b) fungal diseases, while the second volume is to treat of virus and disfunctional diseases.

In this first book chapters I, III, IV, V, VII §1, and part of VIII are by E. Baldacci, while A. Buzzati-Traverso has collaborated in Chapter X. It comprises a general introduction (pp. 1–26) followed by chapters on systematics (pp. 27–46), the biology and manner of spread of fungi (pp. 47–121), pathogenesis and immunity (pp. 122–206), pathological anatomy and physiology (pp. 207–237), biologic specialization of pathogens, heterothallism, and variability (pp. 238–274), symptomatology (pp. 275–308), epiphytology (pp. 309–364), and the principles (pp. 365–585) and practice (pp. 586–707) of control.

Kovačevski (I. C.). Десет години растителна защита. [Ten years of plant protection.]—Institute for Plant Protection, Sofia, 128 pp., 1945.

This is a survey of the work carried out by the Institute for Plant Protection, Sofia, from April, 1935, to December, 1944. The book is divided into nine sections dealing, inter alia, with the dissemination of information on plant diseases and their control; the organization of plant protection; and control by means of chemical preparations and sanitation.

In the research section (pp. 31–94), most of which has already been noticed in this *Review*, the following physiological races of *Puccinia glumarum* [*R.A.M.*, xiii, p. 757] are reported from Bulgaria: 2, 3, 6, 16, 18, 20, 35, and 40 on wheat, 23 and 46 on barley, and 34 on rye. In addition to the physiological forms of *P. triticina* already noticed [ibid., xi, p. 33; xxvii, p. 226], 16, 84, 86, and 93 are mentioned. Of the 13 Bulgarian races of *P. graminis* [ibid., xiii, p. 500; xxii, p. 92] the most common are 40, 34, and 116.

Van Hell (W. F.). **Phytopathology in Switzerland.**—*Chron. Natur.*, civ, 4, pp. 105–111, 1948.

In this paper, the author, phytopathologist of the A.V.R.O.S. Experimental Station, Medan, Sumatra, summarizes the information obtained during a visit to Switzerland in the winter of 1947.

Among the new fungicides in use, oxyquinoline products, such as tumex [*R.A.M.*, xxvi, p. 186] and travacid [ibid., xxvi, p. 187], being very expensive (about 30 fr. per kg.) are employed only in special cases, e.g., against *Coniothyrium diplodiella* on vine [ibid., xxvi, p. 6]. Organol [ibid., xxvi, p. 185] and pomarsol [ibid., xxvi, p. 157] (organic sulphur sprays based on tetramethyl thiuram disulphide) are used against *Venturia inaequalis* and *V. pirina*, respectively.

Biological tests of new fungicides in the Swiss experimental stations are usually made on slides on to which different concentrations of the material are sprayed. After drying, spore suspensions (*V. inaequalis* is often used) are put on the slides and germination determined, Bordeaux mixture generally being used as the standard of comparison. Seed disinfectants are tested by Gassner's method [ibid., xxii, p. 490]. If the results of a test are favourable, the action of the material on the plant is next studied (phytocidal test). If this also proves satisfactory, glasshouse or garden tests are made, after which field trials in different localities and in different years have to be carried out before the new material is officially approved.

Steyaert (R. L.). **Vues sur la phytopathologie en Afrique centrale.** [Views on phytopathology in central Africa.]—*Publ. Inst. nat. Étude agron. Congo belge, 1947* (hors sér.), pp. 677–681, 1947.

The enormous changes introduced into agricultural practice in central Africa in the last 70 years have caused a loss of natural equilibrium highly favourable to the spread of epidemic diseases. Crops that have been grown for centuries now show a decline in sanitary condition, e.g., maize is affected by *Sclerospora maydis* and streak, groundnut by rosette, cassava by mosaic, sweet potato by a (presumed) virus, and oil palm by wilt and other diseases [*R.A.M.*, xxvii, p. 122, *et passim*].

The causal organisms responsible for these epidemics are of two kinds, native and introduced. Native epidemics on indigenous hosts, such as foot rots, stigmatomycoses, etc., were previously part of the local biological complex, but new conditions have greatly increased their importance. Pathogens which have adapted themselves to imported crops, such as cacao swollen shoot virus, are new elements in the local biological complex.

The white man, on the other hand, is responsible for the presence of introduced parasites. Some introduced crops remained healthy for a long time and became

diseased much later when further importations were made, e.g., *Fusarium vasinfectum* on cotton [ibid., xxvii, p. 122] and *Phytophthora infestans* on potato [ibid., xxvii, p. 123]. At the rate at which crops are being imported at present the risk of introducing epidemic diseases is very great. Parasites under modern conditions of transport can be rapidly carried from one continent to another. To obviate this as much as possible, all the States, Protectorates, and Colonies south of the Sahara should take common precautions. Quarantine and inspection stations should function *pari passu* with the introduction of plants. Stations like that at Amani in Tanganyika Territory should be established at strategic points in every territory in Africa.

Tokunaga (Y.) & Hashioka (Y.). **A list of diseases of crop plants in Hainan. A preliminary report.**—*Nong-pau* [*Agricultural Report*], [published by Taiwan agric. Res. Inst., Formosa], ii, 3, pp. 131–134, 1948. [Chinese.]

This is a provisional list of diseases noted by the authors during a visit to Hainan in August and September, 1942. The records are arranged according to the hosts, which total 95, three diseases being on duplicate hosts.

Davies (O. L.), Duckworth (R. B.), & Harris (G. C. M.). **A method for estimating percentage germination of fungal spores.**—*Nature, Lond.*, clxi, 4095, p. 642, 1948.

Spores are added to a liquid nutrient medium in a plugged vessel so that the final concentration is not less than 1×10^6 spores per ml. of medium. The vessel is shaken on a rotary or reciprocal shaking machine at a fixed temperature and samples are taken at intervals, fixed, and counted when convenient. This method, which is applicable to any fundamental research into the physiology and biochemistry of spore germination, possesses the following advantages: conditions are readily standardized; it is quickly and easily operated; and large samples can be taken from the same population and kept for future use.

A statistical analysis showed that the suspension was uniform, stable, and yielded accurate samples.

Dufrénoy (J.) & Pratt (R.). **Evidence for an electrostatic field on Penicillin assay plates.**—*Nature, Lond.*, clxi, 4100, pp. 849–850, 1 fig., 1948.

Changes in electrostatic charge caused by the action of penicillin on susceptible bacteria and resulting in the development of an electrostatic field can be demonstrated on penicillin assay plates by treatment with electro-negative or electro-positive colloids suspended in buffers at pH levels above or below the isoelectric range of the nucleoproteins. It has been suggested that the charge may be used quantitively for assaying solutions of penicillin.

Weatherburn (Muriel W.) & Bayley (C. H.). **The resistance to weathering of Cotton duck treated with certain compounds of iron, chromium, and copper.**—*Canad. J. Res.*, Sect. F, xxvi, 1, pp. 24–35, 1948.

Unbleached cotton tentage duck was impregnated with chromic oxide, copper carbonate, and ferric oxide, singly and in mixtures, each metal being present in a concentration of approximately 1 per cent. as metallic oxide and also in the form of naphthenates in equivalent concentration, and the rot resistance of the treated samples was determined by measuring the loss of breaking strength on soil burial after leaching in water and after outdoor weathering for four months [*R.A.M.*, xxvi, p. 253]. The following results were obtained.

The samples treated with chromium and iron in inorganic form, used singly and together, showed no resistance to burial and only very slight resistance when the metals were present as naphthenates. All the treatments containing copper gave

substantial resistance to burial, the mixtures producing greater resistance than the single compounds. The resistance resulting from treatment with chromium plus copper and with chromium plus copper plus iron mixtures was greater than that from the corresponding copper plus iron treatments. On the whole, the inorganic treatments produced more resistance to burial after leaching than did the organic, but after weathering the copper alone and copper plus iron treatments gave less resistance than the corresponding naphthenate treatments. All the inorganic treatments containing chromium gave marked protection against deterioration due to weathering, as judged by breaking strength losses and increases in cuprammonium fluidity.

The naphthenate treatments containing chromium and the iron oxide and iron naphthenate treatments conferred some protection against loss of breaking strength, but gave fluidity increases approximately equal to those of untreated fabric. Similar results followed copper carbonate plus iron oxide treatment.

The samples treated with copper carbonate and copper naphthenate showed breaking strength losses approximating to those of the untreated control, but gave evidence of enhanced degradation as judged by fluidity data.

Losses of chromium on weathering were negligible, whereas loss of iron ranged from 0 to 34 per cent. Copper was wholly lost from the copper carbonate treated sample and to the extent of 85·4 per cent. following the copper plus iron treatment. In the presence of chromium and chromium plus iron, copper loss was reduced to 34 and 54·2 per cent., respectively. Similar trends were observed in the naphthenate treated samples, but the losses were much less severe. It has been established that naphthenic acids impart some rot resistance.

Macmillan (W. G.) & Basu (S. N.). **The detection and estimation of damage in Jute fibre. Part I. A new microscopical test and the implication of certain chemical tests.**—*J. Text. Inst., Manchr*, xxxviii, 10, pp. T350–T367, 8 figs., 1 graph, 1947.

In connexion with studies at the Indian Jute Mills Association Research Institute, Calcutta, on the physical, chemical, and biological deterioration of jute, a microscopical test was devised based on the swelling of the fibres of the test material when given a short pre-treatment with cold alkali and then treated on a slide with Herzberg's reagent (i.e., zinc-chlor-iodide) and heated carefully. Of the chemical tests used in the experiments, those based on methylene blue absorption and alkali solubility provided useful assistance in determining the causes of damage. Micro-organisms are very prevalent under warm, humid conditions, among those isolated from yarn samples sprayed with a filtered soil extract and then kept for eight weeks in a desiccator over water in a partially darkened room being *Chaetomium indicum* [*R.A.M.*, xvi, p. 232], *Penicillium luteum*, *Aspergillus fumigatus*, and a species of *Actinomyces* actively utilizing cellulose.

Fungal damage on jute goods can usually be differentiated from other forms of deterioration by various subsidiary tests, including the cotton blue stain, and prompt examination under the low-power microscope will generally reveal the hyphae before they have had time to dry off. After the apparent disappearance of signs of mildew the abnormal incidence of any species may be gauged by plating out small samples of the material on acidified Czapek's agar and careful interpretation of the nature and number of the developing colonies [ibid., xix, p. 20]. For example, *Paecilomyces varioti* [ibid., xxv, p. 354] has been isolated in this way from mildewed jute goods that had undergone extensive staining and deterioration. The pH of an extract from mildewed material tends to be more acid than that of normal jute, while chemical analysis usually shows a loss in the cellulose and hemicellulose in preference to the lignin contents. Thus, the extensive yellow-stained portion of a sample from a local mill yielded a monoverticillate species of

Penicillium, the acid secretions of which are believed to have been responsible for the defect. The percentages, calculated on oil-free, oven-dry jute, of Cross and Bevan cellulose, xylan on cellulose, and xylan on jute in the unstained and stained portions of the bag were 66·07 and 39·46, 16·27 and 10·38, and 10·75 and 4·09, respectively, the pH of 1 per cent. extract 6·5 and 5·5, respectively, and the alkali solubility 18·1 and 59·5 per cent., respectively.

Sartory (A.), Sartory (R.), & Meyer (J.). **Le rôle des Actinomyces cellulolytiques dans les altérations des toiles de Lin et de Chanvre utilisées au cours de la fabrication des caséines.** [The function of the cellulolytic *Actinomyces* in the deterioration of Flax and Hemp cloths used in the course of casein manufacture.]—*C.R. Acad. Sci., Paris*, ccxxvi, 15, pp. 1212–1213, 1948.

From flax and hemp fibres originating in the bags and filters used in the processes of casein manufacture and transport, the authors isolated three strains of *Mycoderma*, a *Torula*, a *Saccharomyces*, a *Penicillium*, and an *Actinomyces* associated with a *Mycoderma*. The *Actinomyces* proved to be highly cellulolytic, a pure culture destroying 8·12 per cent. of the cellulose of filter paper in 45 days and 18·24 and 18·94 per cent. of that of hemp and flax, respectively, in 69. In symbiosis with the *Mycoderma* the corresponding figures were 3·8, 9, and 12·5, respectively. The characters of the *Actinomyces* in culture are described.

Westgate (M. W.). **Preservatives and mildew-proofing agents—new members of the paint family.**—*Circ. Amer. Paint Varn. Mfrs' Ass.* 719, 13 pp., 6 figs., 1947.

Outstanding progress, stimulated by the exigencies of the second world war, has been made of recent years in the development of preservatives and mildew-proofing agents, and some of these compounds are now becoming available for civilian use in the United States. Their application to the control of wood and textile rots and mildew on fabrics, paint products, and leather is discussed in the light of modern research, many aspects of which have been noticed from time to time in this *Review*.

Fries (N.). **Spontaneous physiological mutations in Ophiostoma.**—*Hereditas, Lund*, xxxiv, 3, pp. 338–350, 2 graphs, 1948.

Monoconidial cultures of five physiological strains of *Ophiostoma multiannulatum* [*Ceratostomella multiannulata*: *R.A.M.*, xxvi, p. 313] were examined physiologically. Of 51,037 such mycelia, 125 deviated physiologically from the mother strains, at least 80 being true mutants, representing 13 types with different nutritional requirements. Six of the mutants were obtained from 21,721 normally growing conidial cultures, and 74 from 29,316 starvation cultures, in which the absence of one essential constituent rendered growth impossible. It appeared that most of the mutants must have been present in the growing cultures from which the inoculum was obtained and that a selection of spontaneous mutations and not an induction of mutations was at work in the starvation cultures. Conidia from starvation cultures were longer-lived than normal conidia and it is assumed that the viability of conidia is proportional to their degree of heterotrophy.

Venkatarayan (S. V.). **Fungous diseases of Paddy.**—*Mysore agric. J.*, xxv, 4, pp. 106–107, [? 1947].

The most common pathogens attacking rice in Mysore are (in order of severity): *Piricularia oryzae* [*R.A.M.*, xxiv, p. 472; xxvii, p. 255], *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xxv, pp. 27, 317], and *Ephelis oryzae* [ibid., xvii, p. 295; xxvi, p. 27].

It is suggested that several physiologic races of *P. oryzae* occur in India, which explains the susceptibility of some rice varieties to blast in certain localities and

their resistance in others. The most resistant varieties are Adt. 6 and Co. 4, whilst Co. 15 and Co. 16 were resistant in some years and showed much promise in Nellore, Cuddappah, and Coimbatore districts of Madras.

Hutton (E. M.). **Resistance in the Potato to the spotted wilt virus.**—*J. Aust. Inst. agric. Sci.*, xiii, 4, pp. 190–192, 2 figs., 1947.

During 1945 and 1946 tomato spotted wilt virus seriously damaged potato crops in Southern Tableland districts of New South Wales [*R.A.M.*, xxvii, p. 34] and was also prevalent in Victoria and at the Dickson Experiment Station, Canberra, where disease incidence appeared to be closely related to the density of the thrips vector [*Thrips tabaci*: ibid., xxvi, p. 457]. A study, made in 1946, of the incidence of spotted wilt in plots of hybrid plants showed that the potato is naturally fairly resistant to the disease, that Brownell, Brown's River, Snowflake, and Epicure probably carry a high proportion of resistance factors, and that early planted susceptible varieties are not usually infected. Systemic infection can be avoided in susceptible varieties, such as Up-to-Date, if they are past the flowering stage when exposed to severe thrips invasion. The disease is not likely to menace the Australian potato industry, as it was found that resistance to spotted wilt in the susceptible pre-flowering stage can be obtained by breeding.

Ricchello (A.) & Goidànich (G.). **La produzione delle Patate da seme in Cecoslovacchia e in Olanda nel dopoguerra.** [Post-war seed Potato production in Czechoslovakia and Holland.]—*Ann. Sper. agr.*, i, 3, *Suppl.*, pp. i–xxix, 14 figs., 1947. [English summary.]

Following an official visit made to Czechoslovakia and Holland in 1946, the authors describe the organization in these countries governing the selection and production of seed potatoes. Particular reference is made to modifications introduced since the war and to aspects of the matter of special interest to Italian growers and technicians.

Hudson (P. S.). **The British Commonwealth Agricultural Bureaux's Potato Collection.**—*Food & Agric., 1948*, 4, pp. 271–273, 1948.

Following the original Russian investigations under N. I. Vavilov into South American potatoes as a source of breeding material, the British Commonwealth Agricultural Bureaux dispatched an expedition to South America which collected over 1,500 different potato forms [*R.A.M.*, xxvii, p. 291]. They include a number of distinct botanical species, some of which differ from *Solanum tuberosum* in chromosome number, 24, 36, 48, and 60 having been found among the cultivated species and 72 among the wild.

The collection is grown in special insect-proof greenhouses to prevent the spread of virus diseases. Investigations have shown that some types appear to possess complete and others very high degrees of resistance to certain virus diseases. They have, however, a number of defects, the tubers being generally small and irregular, with an undesirable colour or flavour.

Kumamoto (Y.). **Effects of the cultural solutions of Rice blast and Jute anthracnose organisms on the occurrence of the diseases.**—*Nong-pau* [*Agricultural Report*], [published by Taiwan agric. Res. Inst., Formosa], ii, 4, pp. 192–195, 1948. [Chinese.]

Rice and jute seeds were treated with the boiled and unboiled cultural solutions of the respective pathogens of rice blast [*Piricularia oryzae*] and jute anthracnose [? *Colletotrichum corchorum*: *R.A.M.*, xx, p. 465] for 4, 8, 12, and 24 hours, and then separately sown in pots, 25 and 50 seeds being used, respectively, and each pot being duplicated. The incidence of rice blast was somewhat reduced by this treat-

ment and the growth of the seedlings slightly stimulated provided the time of treatment was not too long, while the reverse was the case if it was prolonged. Jute, however, appeared to be unaffected by the treatment.

Săvulescu (Olga). **Micromycètes trouvés sur le Riz en Roumanie.** [Microfungi found on Rice in Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxii, pp. 305–312, 8 figs., 1940. [Received April, 1948.]

A list is given of fungi recorded on rice, excluding Phycomycetes and some others [cf. *R.A.M.*, xv, p. 681], from all parts of the world up to the time of writing. A fungus found by the author on this host in the Danubian plain in 1937 and considered new is described and named *Mycosphaerella danubialis* n.sp. *Piricularia oryzae* was found on rice in Rumania in 1937 and 1938.

Cralley (E. M.). **Rice seed treatment.**—*Rep. Ark. agric. Exp. Sta.* Ser. 5, 5 pp., 1947.

The results of experiments conducted in 1945 and 1946 at the Rice Branch Experiment Station at Stuttgart, Arkansas, showed that the average stands and yields of the Zenith, Blue Rose 41, and Nira varieties, used in 1945, and Prelude, Arkansas Fortuna, Nira, and Zenith in 1946 were considerably increased when the rice seed was treated with arasan (1½ oz. per bush.), phygon (2 oz.), and new improved ceresan (½ oz.), the average yields in bush. per acre for the treated plots being 46, 46, and 43, respectively, compared with 41 for the untreated. In 1946 the best results were obtained when 200 lb. cyanamide per acre was added, the average yields from the treated plots being 47·2, 46·2, and 44, respectively, against 40·7 for the untreated, whereas the corresponding treatments without cyanamide gave yields of 35, 33·7, and 31·2 compared with 31·7 for the untreated.

The average yields of arasan-treated, threshed lots were 49·7 bush. per acre compared with 40·5 for the untreated, the corresponding figures for combine-harvested seed being 47·5 and 45·7, respectively. Dow 9 B, yellow cuprocide, and spergon also showed promise on the basis of one year's test.

Since it is impossible to predict whether any seed-borne disease will be prevalent in any particular year, and because of the very low cost of arasan and phygon a rice seed treatment is recommended each year as an insurance.

Martin (W. J.). **The occurrence of South American leaf blight of Hevea Rubber trees in Mexico.**—*Phytopathology*, xxxviii, 2, pp. 157–158, 1948.

On 26th September, 1946, the presence of South American leaf blight (*Dothidella ulei*) of *Hevea* rubber [*R.A.M.*, xxvii, p. 41] was discovered by the writer and T. D. Mallery in a seedling nursery near Teapa, Tabasco, southern Mexico, where the disease was not previously known to exist. The infection did not appear to be more than about three months old, and new foci were detected in most of the one-year-old seedling nurseries in the locality. Since these nurseries had been planted with healthy seed of mature trees from El Palmar in the State of Veracruz, the infection was presumed to have originated from some of the ten or more isolated rubber plantings in Tabasco or Chiapas started about 1910 and subsequently abandoned. One of these, in the north-west of Chiapas, contains 18,000 trees, an inspection of which revealed evidence of leaf blight dating from at least two years earlier. The same trees had been found free from infection by *D. ulei* in 1941, so that the pathogen was evidently harboured by some other local planting, since no foreign *Hevea* material has been introduced into the zone of recent years. Another planting of some 800 trees in north-eastern Chiapas was found to be heavily infected; the disease had apparently been established there for many years and the fungus was probably introduced with the original (1910)

planting material, the source of which is unknown. Numerous volunteer seedlings growing under the old trees in this planting were sold to a farmer and distributed in the Teapa district of Tabasco. On 11th October, 1946, J. Matz observed incipient leaf blight infection in the large seedling nurseries at the El Palmar Experiment Station, into which it was probably introduced by workers coming from the Tabasco-Chiapas zone under an exchange system.

A thorough inspection of Guatemalan plantings in November, 1946, failed to reveal any leaf blight, which is apparently absent, too, from those of Honduras, Nicaragua, Haiti, and the Dominican Republic. The extension of the disease from its hitherto restricted area in Mexico should not interfere with the rubber-planting programme, since the country is well provided with resistant clones for use in top-budding the prolific but susceptible material being planted.

De Silva (C. A.). **Botanical and Mycological Department.**—*Rep. Rubb. Res. Bd Ceylon, 1946*, pp. 7–12, 1947.

In this report [cf. *R.A.M.*, xxvi, p. 262] (with which C. G. Hansford is associated) it is stated that during 1946, incidence of *Oidium* leaf disease of rubber [*O. heveae*: loc. cit.] was relatively light in the low-country districts of Ceylon. During August, heavy secondary leaf fall was caused by *Phytophthora* [*palmivora*: ibid., xxiv, p. 204]; on most estates defoliation was confined to small pockets of infection. The high incidence of brown bast [ibid., xxv, p. 183] in young budded rubber still causes concern. There is evidence of a connexion between the development of brown bast about the end of the third tapping year in certain high yielding clones and the tapping system practised in the early tapping years. Various methods of scraping and 'tapping off' diseased areas with periods of resting and applications of disinfectants were tested on 50 budded trees, but the results failed to indicate that any particular treatment favoured recovery. It would appear that the conclusions drawn from the results of light scraping treatment [ibid., xxv, p. 43] were premature.

Van Leer (R.). **Premiers résultats de la lutte contre les pourridiés de l'Hévéa à Yangambi.** [First results in the control of foot rot of *Hevea* Rubber at Yamgambi.]—*Publ. Inst. nat. Étude agron. Congo belge, 1947* (hors sér.), pp. 691–707,1 pl., 2 graphs, 1947.

The most important fungi causing root rot of *Hevea* rubber in the Belgian Congo are *Fomes lignosus*, *Ganoderma pseudoferreum*, and *Armillaria mellea*; *F. noxius* is very uncommon locally.

Experiments on the control of the rots caused by the first three organisms were begun by the Rubber Division of I.N.E.A.C. in 1945 at Yangambi, to verify under local conditions the results obtained in Malaya and the Dutch East Indies with the so-called 'standard' system of sanitary treatment [*R.A.M.*, xxvi, p. 466]. Careful analysis of the data obtained to date showed that the results were far from conclusive. The method exercised an appreciable effect on the mortality due to root disease but did not completely arrest spread or cause the disease to regress. Failure appeared to be due mainly to the enormous accumulation of infection sites, which cannot be completely extirpated; partial extirpation appears to do even more harm than using no control at all. Digging trenches round the infected areas only means that in a few years' time the whole plantation will be trenched. Making shallow basins at the foot of the trees does not prevent those parts of the lateral roots which remain embedded in the soil from continuing to proliferate and so, possibly, becoming infected; infection may also reach the tap root through the root itself or through deep lateral roots. The method also presents the disadvantage of being extremely onerous. Pending further investigations, however, it is not recommended that the method should be abandoned.

McCalla (T. M.). **Influence of some microbial groups on stabilizing soil structure against falling water drops.** —*Proc. Amer. Soc. Soil Sci.*, xi, pp. 260–263, 1947. [Abs. in *Chem. Abstr.*, xlii, 9, pp. 3118–3119, 1948.]

At the Nebraska Agricultural Experiment Station the order of decreasing efficiency of different microbial groups for soil lump stabilization against the beating action of water drops was (*a*) fungi, (*b*) Actinomycetes, (*c*) certain bacteria, (*d*) yeasts, and (*e*) the majority of bacteria. The presence of competing organisms of low stabilizing power reduced the effectiveness of microbial groups with a high stabilizing capacity. When the soil flora was added to pure cultures, the stabilizing power of fungi was decreased and that of bacteria increased. The source of energizing material for microbial growth was important in soil structure stabilization, crop residues being less rapid and effective for this purpose than soluble sugar.

Darpoux (H.). **Maladies nouvelles on peu connues du Carthame.** [New or little known diseases of Safflower.]—*Ann. Épiphyt.*, N.S., xii, pp. 297–315, 17 figs., 1946. [Received May, 1948.]

During 1945, safflowers growing at Versailles were severely affected by a mildew, identified as *Erysiphe cichoracearum* f. *carthami* [*R.A.M.*, xvii, p. 838; xxv, p. 416]. Nearly all the leaves were covered on both sides with mycelium, and many were prematurely drying up. Plants severely attacked by rust [*Puccinia carthami*: ibid., xxvi, p. 214] were usually least affected. In 1946, the disease was somewhat less in extent. In both years numerous perithecia were noted early in August. The surface hyphae were approximately 10 μ in diameter, with round or piriform suckers. The conidiophores, 110 to 120 μ long, mostly consisted of four cells, the basal one of which generally measured 35 to 60 by 8 to 12 μ. The cylindrical or barrel-shaped conidia measured 27 to 36 by 16 to 18 μ, and the perithecia, present on both leaf surfaces, 90 to 130 μ in diameter. They contained 6 to 8 widely oval to subcylindrical asci measuring 64 to 75 by 28 to 36 μ. Each ascus contained two ovoid ascospores measuring 20 to 25 by 14 to 16 μ.

In July, 1946, safflower leaves showed chestnut-brown spots surrounded by dark, concentric zones and measuring 5 to 25 mm. in diamter. When very numerous, these spots became confluent, the leaf blade then drying up partially or completely. In one instance a fungus was also found on a safflower stem, half-encircled by a lesion 6 cm. long at the base of a dead leaf. On both surfaces of the leaf spots there were slightly flattened or spherical pycnidia measuring 80 to 160 μ in diameter. The uni- or bicellular, hyaline spores were cylindrical, rounded at both ends, sometimes slightly bent, and measured 5 to 9 by 2 to 3 μ. The fungus is identified as *Ascochyta carthami* [ibid., xix, p. 116].

Other safflower plants showed chestnut-brown leaf spots, frequently bounded by the midrib and secondary veins, and mostly 10 to 25 mm. in diameter. The epiphyllous or hypophyllous pycnidia of a *Septoria* were present on the lesions, measuring 55 to 63 μ in diameter and containing hyaline, unicellular or septate spores measuring 18 to 30 by 1 to 1·5 μ. This fungus is provisionally identified as *S. carthamicola* Tropova.

In August, 1946, light chestnut, circular or irregular leaf spots, 3 to 10 mm. wide, became confluent when numerous and caused leaf withering. Hyaline, unbranched, non-septate conidiophores emerged in tufts through the stomata; they measured 15 to 30 by 2 to 4 μ. The hyaline conidia arose in short chains at the apex of the conidiophore; they were unicellular or uni- to quadriseptate and measured 15 to to 50 by 2 to 3·5 μ. The author considers this fungus to be a new species, which he names *Ramularia carthamicola*.

Small, light brown leaf spots 1·5 to 10 mm. in diameter, surrounded by a darker halo 0·5 mm. wide, bore hyaline or faintly coloured, septate, branched conidiophores measuring 70 to 190 by 5 to 10 μ. The hyaline, unicellular, ovoid to

oval conidia, tapering at the point of attachment to the conidiophore and rounded at the other extremity and sometimes slightly constricted in the middle, were borne singly and measured 16 to 33 by 7 to 12 μ. This fungus, which does not appear to have been described before, is named *Ovularia carthami* n.sp.

MUNGOMERY (R. W.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1946–47*, pp. 35–45, 1947.

In this report [cf. *R.A.M.*, xxvi, p. 262] it is stated that for the second successive year sugar-cane gumming disease (*Bacterium* [*Xanthomonas*] *vasculorum*) was recorded in Queensland commercial crops in the one mill area only, namely, at Mossman. Two new centres of infection were discovered, on adjoining farms south of the Mossman River and about three miles from the nearest known diseased fields. The quarantine area was enlarged to include these outbreaks.

No reports of downy mildew (*Sclerospora sacchari*) were received from the Mossman area. Bundaberg was the only district where downy mildew was found, inspection of 16,536 acres showing 1,936 stools to be diseased. One block of 7·5 acres was severely infected, having over 600 diseased stools, but most of the other diseased blocks were only slightly attacked. Roguing by trained gangs appears to be the most suitable method of control, being preferable to the sudden loss of the valuable, if susceptible, P.O.J. 2878 cane; nevertheless, it is expected that the disease will decrease appreciably only when this variety is replaced by newer, more resistant canes.

In the Bundaberg district, 2,288 canes were found to be affected by Fiji disease in 16,536 acres inspected. Seasonal conditions contributed to this improvement, but the much larger planting of resistant varieties (C.P. 29/116, Atlas, Q 28, Q 42, Q 47, and Q 49 instead of P.O.J. 2878 and Q 25) has reduced the disease in the quarantine areas at Tantitha and Avondale. At the Bingera Plantation, which is irrigated and produces a succession of lushly grown crops ideal for the spread of the disease, even the commercially resistant Q 49 was affected. No Fiji disease was reported from the Isis area, largely owing to severe drought. In the Maryborough area five farms were affected and 29 stools were rogued. The disease remains a serious problem in the Moreton area, where 10,721 affected stools were rogued. In this locality control is rendered difficult by the fact that areas of good soil produce succulent crops every year, and wet weather seriously interferes with inspection at the most suitable stage. Further, frost damage was so severe and widespread in the winter of 1946 that many healthy crops were too badly injured to be used for spring plantings. In some instances there was no alternative but to take plants from doubtful sources, thus further complicating the problem of control. The Cane Pest and Disease Control Board intensified their roguing campaign, and the extension of the more resistant varieties, such as Vesta, Q 28, Q 47, and Q 49 should lead to some degree of control.

In North Queensland, leaf scald (*Bact.* [*X.*] *albilineans*) seems likely to become a major trouble, some of the newer canes, especially Q 44 and Trojan, showing a good deal of susceptibility in commercial plantings. The persistence of symptoms in Trojan was well demonstrated in a resistance trial. This feature has an important bearing on the commercial reaction of a variety, in that when symptoms persist in live stools, the variety is not self-cleaning, and so becomes more heavily infected as the crop cycle advances.

Chlorotic streak in the northern mill areas was generally confined to the normally wet, low-lying fields and was not noticeable on well-drained soils. During the year the disease was recorded for the first time at Maryborough, where it appeared in two small blocks of ratoon P.O.J. 2878, which showed 4 to 5 per cent. infection. At Moreton the disease affected most of the approved varieties and also Akbar, Q 47, Q 49, Trojan, and Vesta. It causes considerable losses in parts of the area.

In July, 1946, R. A. Abbott positively identified chlorotic streak in the Gazelle Peninsula on the island of New Britain, off the north-west coast of New Guinea, apparently the first record for the island.

Very dry conditions in winter and spring in the central areas induced a good deal of red rot (*Physalospora tucumanensis*) in certain varieties during the 1946 harvest. Q 50 developed considerable infection in some fields, but Co. 290 and, to a less extent, Q 28 also became infected. Tonnage and sugar yields were reduced, sometimes seriously. In the southern mill areas, dry weather and frost caused many crops to become heavily infected, and some were destroyed while others were condemned by the mill. The projected distribution of the vigorous cane Q 52 has been postponed pending further observations; it appears to be too susceptible for commercial cultivation. The early symptoms seen on the variety in autumn were unusual. They consisted of white to pale yellow, broken streaks up to 8 mm. wide and ranging in length from a few cm. to the full length of the blade. One to many streaks occurred on a leaf, and where they were numerous a mosaic-like pattern resulted. Leaves of all ages were affected, and a varying number in each top. Affected shoots per stool ranged from one to every stick in the stool. As the streaks aged, necrotic areas appeared, and eventually the whole streak became involved. Internally, the stem was healthy except for a few reddened vascular bundles and a slightly acid odour in the bottom few inches. The affected crops were well grown and gave promise of satisfactory yields, but the disease later became systemic and many dead stalks resulted.

A large-scale survey of the Mackay district (the only area where dwarf disease has been recorded) was carried out by the Cane Pest and Disease Control Board in the spring of 1946, and 2,186 stools affected with dwarf were rogued. The variety most commonly affected was P.O.J. 2878, followed by H.Q. 426, E.K. 28, and Q 45.

Top rot (*Phytomonas* [*X.*] *rubrilineans*) [ibid., xxiv, p. 206] and its red stripe stage were present, but did not cause appreciable losses, in the northern areas. The red stripe stage was not usually found on Trojan, on which the early symptoms were an unthrifty appearance of the whole top and a purplish tinge of the young leaf sheaths; the death of all the leaves coincided with that of the heart and the development of the characteristic odour. Early in 1947, red stripe became prevalent in the Bundaberg area, mainly on P.O.J. 2878 and Q 49, but there was little development into the top-rot stage.

Mosaic [ibid., xxv, p. 278] occurs in the Burdekin area in small amounts. It is still present at Mackay, but with the replacement of susceptible varieties in river and creek-bank fields by P.O.J. 2878 and on clay-bottomed lands by Q 28 and, to a less extent, by P.O.J. 2878, the affected area has much diminished. In the south, mosaic chiefly affects Q 25 and Q 42, and to some extent Q 49, though in the Moreton area several other varieties are also susceptible.

Miscellaneous records include the following. In the Moreton mill district several blocks of well-grown crops showed a rot that spread into several nodes midway up the stick. Infection had occurred through eyes that had been killed by frosts; it had then passed through the tissues of the node. In many cases, *Pleocyta sacchari* [ibid., xviii, p. 274] was present. Red rot of the leaf sheath (*Sclerotium rolfsii*) was prevalent in the northern mill areas when the first rains of the wet season stimulated the canes to succulent growth. On Trojan the fungus often grew through the leaf sheath and into the rind of the young internodes, inducing shallow stem cankers. The damage was striking externally, but the canes were normal within.

Experiments showed that soaking cane plants in mercurial preparations greatly accelerated the rate of germination. It was found that when a stronger solution was used a dip of a few minutes gave some stimulation and also afforded protection against *Thielaviopsis* [*Ceratostomella*] *paradoxa*. Further work is in progress.

Evans (H.) & Wiehe (P. O.). **Experiments of Cane setts at planting under Mauritius conditions.** *Bull. Mauritius Sugarcane Res. Sta.* 19, 36 + ii pp., 1947.

A detailed account is presented of co-operative experiments carried out in Mauritius from May, 1946 onwards to determine the effects of the pre-treatment of sugar-cane cuttings with organic mercury compounds and other substances in relation both to the diseases which affect germination of the cuttings (chiefly pineapple disease due to *Ceratostomella paradoxa*, chlorotic streak, and red rot due to *Physalospora tucumanensis*), and to the sprouting and growth of the young shoots [cf. *R.A.M.*, xxvii, p. 156].

In extensive experiments at three different centres agrosan gave 86 per cent. control of pineapple disease and increased the total length of shoots per germinated cutting by 7·2 per cent., the corresponding figures for ceresan being 85 and 9·4, and for aretan 92 and 19·8, respectively.

In further experiments to test the effect of organic mercury treatments aretan and ceresan reduced pineapple disease by 87 per cent., abavit by 86, agrosan by 83, harvesan by 80, and verdasan by 76. The variety most resistant to *C. paradoxa* was M134 32, followed in decreasing order by M63 39, M171 30, M165 38, and M76 39.

Investigation of the effect of 1 per cent. aretan on the pineapple disease reaction and growth of different varieties (M171 30, M134 32, M112 34, M165 38, M63 39, and M76 39) showed that the mean percentage germination was 89·92 per cent. for the aretan-treated plots and 66·56 for the controls. The percentage of cuttings infected was 11·37 per cent. for those treated with aretan and 45·05 per cent. in the controls, while mortality was 2·04 and 26·04 per cent., respectively. Germination was poorer in M112 34 than in any other variety, while for M134 32 it was significantly poorer than for all except M171 30 and M112 34. It was also found that independently of other factors, the level of population of the pathogen in the soil appears to be related to the intensity of the disease. Further, varieties such as M63 39, M165 38, and M76 39, which show some resistance under normal conditions, may display greater susceptibility when the fungus is more abundant in the soil.

Concluding experiments confirmed the view that aretan exercises a stimulating effect on growth, apart from its effect in controlling pineapple disease, and also demonstrated that it consistently increased yields of cane by an average of 4 tons per arpent [approximately 1 acre].

[A summarized account of this work also appears in *Rev. agric. Maurice*, xxvi, 6, pp. 288–297, 1947.]

Alcalde (Maria B.). **Notas sobre micromicetos de España.** [Notes on microfungi of Spain.] *An. Jard. bot. Madr.*, vi, 1, pp. 399–416, 7 figs., 1946. [Received May, 1948.]

Comprised in this critically annotated list of some 100 fungi are five new species, while 11 are recorded for the first time in Spain [cf. *R.A.M.*, xxiv, p. 475] including *Uldeina sabina* on juniper and *Glocosporium pachybasium* on box.

Losa España (D. M.). **Hongos de Galicia.** [Fungi of Galicia.] *An. Jard. bot. Madr.*, vi, 1, pp. 417–471, 32 figs., 1946. [Received May, 1948.]

This critically annotated list of fungi of Galicia, Spain, includes a few new species and a number not hitherto reported from the province. Among the records may be mentioned *Plasmopara* [*Pseudoperonospora*] *humuli* on hops, *Puccinia antirrhini* on *Antirrhinum majus* [cf. *R.A.M.*, xxii, p. 53], *P. pruni-spinosae* on plum, almond, and peach, *Cronartium flaccidum* on peony [cf. ibid., xxv, p. 366], and (in its im-

perfect state) *Peridermium cornui* on *Pinus pinaster*, *Macrosporium ramulosum* on parsley, *Alternaria carolinaeana* on *Dahlia variabilis*, and *Septoria chrysanthemi-indici* on *Chrysanthemum* [cf. ibid., xxiv, p. 475].

Bontea (Vera). **Quelques Micromycètes de Roumanie.** [Some Rumanian microfungi.]—*Bull. Sect. sci. Acad. roum.*, xxiv, 5, pp. 321–330, 1941. [Received April, 1948.]

This list of microfungi collected in Rumania comprises 59 fungi (of which 51 are Uredinales) found on 69 hosts. Among those new to the country are *Septoria caraganae* [*R.A.M.*, xxi, p. 405] on leaves of *Caragana arborescens* and *Cromyces betae* on beet leaves, while others, found on new hosts for Rumania, include *C. genistae-tinctoriae* on *C. arborescens* and *Tranzschelia* [*Puccinia*] *pruni-spinosae* on *Prunus cerasifera*. In addition, the following may be mentioned: *Apiosporium* [*Sclerotium*] *salicinum* on plum, *Gymnosporangium juniperinum* [ibid., xxv, p. 185] on apple, and *G. sabinae* [ibid., xxv, p. 493] on pear leaves.

Cummins (G. B.). **Some problems in mycological taxonomy.**—*Mycologia*, xxxix, 6, pp. 627–634, 1947.

In this presidential address to the Mycological Society of America, in Boston, 1946, the author examines the present position of mycological taxonomy and suggests the following important necessities for improving the situation: the preparation of adequate monographic treatments aimed at putting the classification of the fungi into a serviceable form; the need for analysis and evaluation of characters used in classification; the critical re-study of type materials to obviate the need for continual re-examination; the improvement of our knowledge of fungal distribution; and adherence to the International Rules of Nomenclature.

Martens (P.). **Cycle de développement et sexualité des Ascomycètes. Essai critique.** [Life-cycle and sexuality of the Ascomycetes. A critical study.]—*Cellule*, l, 2, pp. 125–310, 1946.

This exhaustive treatise on the life-cycle and sexuality of the Ascomycetes falls into two parts, of which the first sets forth in great detail the observed facts concerning these aspects of the group, and the second critically discusses the problems involved and the interpretations placed upon them by various authorities. A 15-page bibliography is appended.

De Urríes (M. J.). **Acerca de unos cultivos monospóricos de Pleospora herbarum (Pers.) Rab.** [Concerning some monospore cultures of *Pleospora herbarum* (Pers.) Rab.]—*Bol. Soc. esp. Hist. nat.*, xlv, 5–6, pp. 367–368, 1947.

The author's cultural studies on *Pleospora herbarum* were carried out on monospore isolates from two sources, namely, shoots of *Ephedra* sp. and a piece of paper. Perithecia were formed in a week by the paper isolate only. It is concluded, in agreement with Sibilia (*Boll. Staz. Pat. veg. Roma*, N.S., xvi, pp. 63–64, 1936) [and others] that *P. herbarum* is homothallic.

Goidànich (G.). **Revisione del genere Macrophomina Petrak. Specie tipica: Macrophomina phaseolina (Tassi) G. Goid. n. comb. nec M. phaseoli (Maubl.) Ashby.** [A revision of the genus *Macrophomina* Petrak. Type species: *Macrophomina phaseolina* (Tassi) G. Goid. n. comb. nec *M. phaseoli* (Maubl.) Ashby.]—*Ann. Sper. agr.*, N.S., i, 3, pp. 449–461, 7 figs., 1947. [English summary.]

The author's critical observations have confirmed the authenticity of the genus *Macrophomina* Petrak, which occupies a position very close to *Dothiorella* Berl. & Vogl. sensu Petrak and Sydow, differing in the absence in the pycnidia of a

typical extramatrical stroma. The type species is named *Macrophomina phaseolina* (Tassi) G. Goid., following examination of the original material of *Macrophoma phaseolina* collected by Tassi in 1901. Other synonyms are *M. phaseoli* Maublanc 1905, *Dothiorella cajani* Syd. & Butl., *D. philippinensis* Petr., and *Macrophomina phaseoli* (Maubl.) Ashby. Emended descriptions of the genus and species are given.

Tubbs (F. R.). **Spraying and dusting in the control of blister blight of Tea.**—*Tea Quart.*, xix, 3–4, pp. 78–92, 1947.

In considering any plan for the improved control of tea blister blight [*Exobasidium vexans*: *R.A.M.*, xxvii, p. 261 and next abstract] in Ceylon by the use of fungicides [ibid., xxvi, p. 569], three major difficulties must be taken into account, viz., the hilly nature of the ground, the cost, and the necessity for avoiding the least risk of impairing the manufacturing qualities of the crop. At present only knapsack sprayers are practicable and fungicidal applications should be restricted to young tea. Protection depends upon the prevention of infection, and as this occurs mostly on the outermost leaves of the shoot-bud or on the first or second leaves, the protection afforded by any single application ceases as new leaves unfold, while the increasing resistance of the earlier-formed leaves finally renders the fungicide present on their surfaces unnecessary. The need for thorough and repeated treatment follows from the fact that infection can occur on both sides of the leaf and independently of the stomata.

Preliminary experiments at St. Coombs in April to May, 1947, showed that the most promising fungicides tested were dusts and sprays containing copper. In further experiments dusting with copper dusts gave a fairly high degree of control, though in some respects spraying was more effective. At present the cost of dusts is disproportionate to the advantage gained.

An experiment conducted to determine the optimum strength of spray and spraying frequency, using perenox, demonstrated that effective control followed from weekly applications at 2 oz. per 10 gals., the advantage accruing from using 6 oz. being negligible. With fortnightly applications substantial loss of control resulted, which was not made up by using 6 oz. Fortnightly applications allowed good recovery, but spraying at intervals of three weeks resulted in a marked drop in the amount of recovery growth. While the drop was less with the higher spray concentration, the improvement was insufficient to justify the extra cost. Where the protection of tipping growth is desired, spraying should be carried out from bud-break to tipping at the rate of 2 oz. per 10 gals. at intervals ranging from seven to ten, but not exceeding 14 days. At elevations under 3,000 ft., where leaf area during recovery is important, the spray concentration should not be less than 4 oz. per 10 gals. if the spraying interval exceeds seven days.

Other evidence demonstrated that it is possible, by relating leaf development rates, areas of unprotected surface, duration of exposure of unprotected tissues, and spore germination rates, to obtain a calculated value for the ratio of additional infection expected closely agreeing with that observed in the field.

It is concluded that blister blight can be controlled in the field even under monsoon conditions by dusting and especially by spraying, provided the treatment interval is short. For tea in plucking, however, the cost would be prohibitive, whereas in young clearings containing seedlings it may amount to only 75 cents per acre per application. The number of functioning sprayers required will be about one per ten acres, allowing for an average of five days' spraying per week. The cost of protecting clearings two to four years old should not exceed two rupees per acre (one coolie and ½ lb. fungicide per application). Treatment of such clearings would normally be necessary only in special circumstances, e.g., to allow of a longer period of blister-free growth following centring or pruning than would be provided by the dry season normally experienced in a given district. Spraying

mature, pruned tea on steep slopes costs about 3 rupees per acre for labour and spray material. In some cases, spraying pruned tea to facilitate recovery may prove highly profitable. Nursery bushes should be sprayed twice a week and from both sides during the rapid elongation of the stems after germination, and once a week after.

CAMERON (D. S.). **Blister blight in relation to planting and supplying Tea.**—*Tea Quart.*, xix, 3–4, pp. 92–95, 1947.

After explaining why, with the advent of blister blight [*Exobasidium vexans*: see preceding abstract], planting new clearings and supplying old tea have become much more difficult in some of the south-western parts of Ceylon over 2,000 ft., the author expresses the view that the best method is to plant seeds or cuttings at 6 by 6 in. and use the Hersall transplanter. However, supplying by plants grown from seed should now be regarded locally as only an interim method until a sufficient number of plants can be grown from internode cuttings from immune mother bushes. The author has a few beds of internode cuttings taken from mother bushes which have remained completely immune for many months and they are growing satisfactorily in the absence of spraying. Recommendations are made for the satisfactory selection and growing of internode cuttings, and it is suggested that isolated tea seed-bearer gardens should be established from immune planting material.

The paper is followed by a note from the editor (R. V. Norris), in which it is stated that the limiting factor to Mr. Cameron's programme is the amount of suitable nursery space. The Tea Research Institute of Ceylon envisages the use of resistant clones for supplying, rather than for replanting, though the latter may prove economically feasible later.

KASSANIS (B.) & SELMAN (I. W.). **Variations in the reaction of White Burley Tobacco to the Tomato aucuba mosaic virus and to some other strains of Tobacco mosaic virus.**—*J. Pomol.*, xxiii, 3–4, pp. 167–170, 2 pl., 1947.

The results of tests conducted at the Cheshunt and Rothamsted Experiment Stations showed that there are two distinct lines of White Burley tobacco showing slight morphological differences in the leaf laminae. When inoculated with tomato aucuba mosaic virus [? a strain of tobacco mosaic virus: *R.A.M.*, xxi, p. 169] one line developed necrotic local lesions and sometimes a severe systemic necrosis, while the other produced a yellow mottle. Some other strains of tobacco mosaic virus also induced necrosis in the former line.

This evidence indicates that there are genetic differences within a single named tobacco variety which determine whether or not any particular virus strain will produce necrotic local lesions. This reaction may have little diagnostic value, therefore, even when a line of White Burley tobacco, such as Judy's Pride, is specified. This variability has probably been responsible for the conflicting results obtained by various workers using the same combination of viruses and what was presumed to be the same hosts. It is assumed that these genetical differences will exert a selective influence on the strains occurring in stock cultures of tobacco mosaic virus. Strains that produce necrosis will tend to be eliminated owing to the death of the host tissues and will eventually be replaced by strains that cause mosaic and readily become systemic.

ZABALA (A.) & DELLE COSTE (A. C.). **La presencia del mosaico común del Tabaco en los cultivos de Pimiento y Tomate.** [The presence of ordinary Tobacco mosaic in Chilli and Tomato plantings.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, 28, 8 pp., 7 figs., 1947.

The tobacco mosaic virus is stated to be widespread in chilli and tomato plantings in Argentina. Isolates from the former host fell into six distinct strains and

those from the latter into four, which are designated, pending further more intensive studies, by their places of origin.

Four of the chilli strains were positive after ten minutes' exposure to a temperature of 80° C., viz., Ullun (San Juan), Godoy Cruz (Mendoza), Córdoba (Ciudad), and Argerich (Buenos Aires); the remaining two, Alto de Sierra (San Juan) and Resistencia (Chaca), were inactivated by this treatment. Samson tobacco reacted to inoculation with Alto de Sierra by local lesions, sometimes followed by mosaic; to Ullun by necrotic lesions and later mosaic; to Godoy Cruz by local lesions and sometimes by systemic necrosis; to Córdoba by ordinary mosaic; to Resistencia by absence of external symptoms, and to Argerich by necrosis only. A vivid yellow mosaic developed on Marglobe tomatoes inoculated with Alto de Sierra and Ullun; mild mosaic was induced by Godoy Cruz, Códoba, and Resistencia. Alto de Sierra, Ullun, Godoy Cruz, and Argerich caused the formation of local lesions on *Nicotiana glutinosa* (necrotic from the two last-named sources); no symptoms were induced by the other two strains. Ruby King and Large Bell Hot chilli responded to all the strains except Argerich by the development of a mosaic pattern, which was particularly severe and accompanied by defoliation in the case of Resistencia.

All the tomato strains were positive after ten minutes at 80°. Tobacco inoculated with Ranelagh (Buenos Aires) contracted local necrotic lesions and later a faint, ill-defined mosaic; Godoy Cruz induced on the same host a mosaic pattern composed of light yellow spots with pale, sometimes concentric circles; while Alto de Sierra and Cipolletti (Rio Negro) both caused ordinary mosaic. *N. glutinosa* inoculated with all four strains contracted local lesions (necrotic in the case of Ranelagh); the last-named also induced local lesions in *N. sylvestris*. Tomato inoculated with Ranelagh and Godoy Cruz developed mosaic and distortion of the upper leaves and Alto de Sierra and Cippoletti induced mild mosaic. All the strains caused mosaic of chilli.

Smith (T. E.) & Clayton (E. E.). **Resistance to bacterial wilt and black shank in flue-cured Tobacco.**—*Phytopathology*, xxxviii, 3, pp. 227–229, 1948.

Resistance to bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) in the Colombian tobacco variety T.I. 448A [*R.A.M.*, xxvi, p. 570] and to black shank (*Phytophthora parasitica* var. *nicotianae*) in Florida 301 was shown by field trials at the North Carolina Agricultural Experiment Station to be inherited on a multiple factor basis [ibid., xxiii, p. 318; xxv, p. 189; xxvii, p. 264]. In studies on the reaction of the wilt-resistant genotypes T.I. 448A, Oxford 26, and 43–2, all three showed a measure of resistance to *P. parasitica* var. *nicotianae*.

Four genotypes resistant to black shank, namely, Oxford 1, 2, 3, and 201, were tested for wilt-resistance and only Oxford 2 and 201 developed significantly less wilt than the average of the two susceptible flue-cured varieties, Gold Dollar and 400.

Lines resistant to both diseases were crossed in 1941 and the hybrids selected for wilt resistance and attractive growth characters in the F_2, F_3, and F_4. An F_5 wilt-resistant line, Oxford 202, was grown in separate plots infested by *X. solanacearum* and *P. parasitica* var. *nicotianae*. On the former 11 single plant selections of Oxford 202 averaged slightly less wilt than T.I. 448A under conditions inducing 100 per cent. disease in Gold Dollar. On the black-shank plots the same lines of Oxford 202 averaged significantly (0·01) less infection by *P. parasitica* var. *nicotianae* than Gold Dollar. In further tests of resistance to the latter pathogen in Oxford 202, nine F_6 lines averaged 47 per cent. black shank in a planting where the Florida 301 and 400 varieties developed 3 and 100 per cent., respectively. These results in infested soil showed that very high resistance to *X. solanacearum* was recovered, and, furthermore, many lines selected exclusively for wilt resistance were moderately resistant to black shank.

Valleau (W. D.). **Can Tobacco plant beds in Kentucky and Tennessee be infected by Peronospora tabacina blown in from Texas?**—*Plant Dis. Reptr*, xxxi, 12, pp. 480–482, 1947. [Mimeographed.]

As a result of a tour of the Texas tobacco-producing areas during 1947, when a study was made of the incidence of blue mould (*Peronospora tabacina*) [*R.A.M.*, xxvii, p. 163] on *Nicotiana repanda* plants, the author concluded that the fungus reached Tennessee and Kentucky in 1936 from the south-east, and that if *P. tabacina* is eradicated or greatly reduced in Georgia by the use of resistant varieties it may be expected to disappear from the Tennessee–Kentucky area. If, therefore, satisfactory resistant flue-cured varieties are developed for use in the south-eastern States, there will be no need to develop resistant varieties of the types grown in Tennessee and Kentucky. The possibility of soil carry-over of the disease in Louisiana is eliminated by the growers' practice of destroying old beds and the use of new sites each year.

Aberdeen (J. E. C.). **Seasonal notes on Tomato diseases.**—*Qd agric. J.*, lxiv, 4, pp. 219–220, 1947.

The rainy season of 1947 favoured an outbreak of tomato bacterial spot [*Xanthomonas vesicatoria*: *R.A.M.*, xxiii, p. 475, xxiv, p. 478] in Queensland, particularly after transplanting. Seed treatment with mercuric chloride and sterilization of the seed-bed are recommended.

Although the weather in recent years has not favoured heavy outbreaks of Irish blight [*Phytophthora infestans*: ibid., xxvi, p. 32] the need for maintaining routine copper treatments [ibid., xxvi, pp. 220, 269] to guard against epidemics is stressed. During the winter months the dusts used should contain 10 per cent. copper in the event of continuous showers and no less than 7 per cent. in normal weather, while thorough applications of commercial sprays consisting of 1½ lb. of a 50 per cent. compound to 40 gals. [water] should control the disease.

Fennell (J. L.). **Temperate-zone plants in the tropics.**—*Econ. Bot.*, ii, 1, pp. 92–99, 6 figs., 1948.

In this discussion of the factors contributing to the success or failure of temperate plants grown in the tropics the author records that recently in the neighbourhood of Caracas, Venezuela, tomato crops were seriously affected by *Phytophthora infestans* [*R.A.M.*, xxvi, pp. 32, 507], while at the Pampanito Experiment Station near Trujillo, a region having the same humidity and seasonal effects but some 2,000 ft. lower, they were destroyed solely by *Alternaria solani* [ibid., xxvi, p. 36]. In other parts of the country [unspecified] virus diseases were the principal limiting factor. The author points out that the power of climate over variety is an important factor which must be considered in the successful cultivation of temperate-zone plants in the tropics.

Fulton (J. P.). **Infection of Tomato fruits by Colletotrichum phomoides.**—*Phytopathology*, xxxviii, 3, pp. 235–246, 2 figs., 2 graphs, 1948.

In a study at the University of Illinois on some of the factors concerned in the infection of tomato fruits by *Colletotrichum phomoides* [*R.A.M.*, xxvi, p. 426], using the Early Baltimore and Garden State varieties, large green or mature fruits on the vine were readily attacked following inoculation through wounds. Infection developed on unwounded areas of fruits less than 20 days old, but not through injuries. Intact tomatoes became increasingly susceptible to infection from the age of ten days until maturity. In green fruits the fungus remained latent until they ripened, when it produced typical lesions. Detached, mature, uninjured fruits contracted infection through a wide range of temperatures from 50° to 90° F.,

development of the lesions being slow (20 days) at the lower limit and very scanty at the upper, while rapid progress (five to eight days) was made at 60° and 70° and particularly at 80° (often within three days).

C. phomoides penetrates the cuticle of the fruit by means of a tube growing from the lower side of the appressorium. In green fruits the infection tube swells slightly on contact with the cell wall but remains latent between the latter and the cutin layer. As the fruits ripen the fungus extends and produces swollen inter- and intracellular hyphae in the hypodermis, while contact with the parenchyma cells results in the formation of many slender hyphae which quickly permeate the walls and cell contents. Microscopic cracks in the cuticle [ibid., xxvi, p. 319] are not regarded as of any importance in penetration and infection.

No correlation was apparent between the pH of the ripening fruits and lesion development. The pathogen grows well within the pH range of the host, particularly so at 4·5 to 5, the value ascertained for the pericarp.

Kendrick (J. B.) & Walker (J. C.). **Anthracnose of Tomato.**—*Phytopathology*, xxxviii, 3, pp. 247–260, 6 figs., 1948.

All the isolates of *Colletotrichum phomoides* from naturally infected tomato fruits [see preceding abstract] in two localities of Wisconsin fell within the range of acervulus and spore characters described by Chester (*Rep. Del. agric. Exp. Sta.* 6, pp. 103–131, 1893). About 14 fairly distinct types of cultural character were recognized, mostly corresponding to the MC type observed by Tompkins and Hansen in *Gloeosporium thumenii* var. [f.] *tulipae* [*R.A.M.*, xx, p. 305]. Other differences related to the colour of the medium, the prostrate or aerial growth of the mycelium, and the number, size, and arrangement of the stromata. Of the three isolates selected for further study Cp 1 and Cp 5 were of the MC and C types, respectively, while Cp 4 differed from all other strains in its white instead of black stromata. The sparse, stiff setae of Cp 4 were hyaline in contrast to the black ones of all the other isolates investigated. Spore production and cultural characters of Cp 4 remained constant through successive mass transfers over a five-year period.

A relatively high temperature (24° to 28° C.) favoured sporulation, spore germination, growth, and infection. Glucose, dextrin, and soluble starch were good sources of carbon in both liquid and solid media. Sporulation was stimulated by inulin, glucose, sucrose, dextrin, and lactose. Formation of setae was generally correlated with spore production except with the use of ethyl alcohol as a carbon source, when there were many setae but no spores. On potato dextrose agar at 24° both Cp 4 and Cp 5 made very slow growth at pH 2·9, moderate at 3·9, and good at 4·9 to 9·9. Sporulation was absent at 2·9, most abundant at 3·9, fell off slightly at 4·9 to 6·9, then decreased rapidly and was scanty at 9·9. All three isolates sporulated most copiously on nutrient dextrose medium.

In experiments to determine the relation of host substratum to the growth and survival of *C. phomoides* in the soil, it was found that the best growth and sporulation occurred on green and ripe fruit and green stem tissue, alone or mixed with sand, and the poorest on the same substrata in soil. Development on dead stems was intermediate, whether alone or mixed with sand or soil. After overwintering, the fungus was recovered from each substratum with which soil was incorporated, but consistently from sand only when dead stems were used. When the several host tissues were used alone, recovery was effected only from dead stems inoculated with Cp 5. Apparently the slow initial growth of the organism on substrata mixed with soil provided the most suitable conditions for winter survival.

In the autumn of 1943 naturally infected tomato stems were collected from the field, *C. phomoides* being isolated from each of 100 fragments tested. Of 125 stem fragments investigated in the spring of 1946, 111 yielded the fungus. In the same

year 1,000 plants were set out and 25 were inoculated with Cp 4 at the blossom stage and a further 25 when the fruit was green. In mid-September about 10 per cent. anthracnose developed on the fruits throughout the field, the incidence being no higher on inoculated than uninoculated. At the peak of development of the disease 300 random isolations made from infected fruits in both the inoculated and the uninoculated rows all yielded a pigmented strain. Evidently, therefore, the infective material emanated from overwintering refuse and had not spread from the inoculated plants. The same experiment was repeated in 1947 with identical results, which were further confirmed by a second test in the same year.

Evidence of seed transmission was obtained when seven out of 500 seeds from naturally infected fruits yielded *C. phomoides*, which did not develop, however, from any of 950 from the same fruits after ten minutes' treatment with 1 per cent. sodium hypochlorite. When 1,400 seeds from naturally infected fruits were sown in non-infested soil, one plant contracted anthracnose.

Only slight development occurred on inoculated Bonny Best plants incubated in a moist chamber for 24 hours before transference to a greenhouse, the number and size of the lesions increasing at 48 and 72 hours and reaching a maximum at 96, the longest period tested. On leaves bearing lesions setae and spores were produced most abundantly at 28° and 32°, only slightly less so at 24°, and sparsely at 20°, 16°, and 12°. When inoculated plants were placed in moist chambers at 28° and 16° lesions appeared in three days at the high and in 11 at the low temperature.

After six weeks in infested white quartz sand at 28° watered with Hoagland's solution, at an air temperature of 24°, most of the tomato seedlings bore inconspicuous necrotic flecks on the tap-root and hypocotyl, while some of the lateral roots were rotted. In general, however, the retarding effect on plant growth was insignificant.

Strains Cp 4 and Cp 5 proved highly pathogenic to fruits when inoculated through needle punctures, Cp 4 attacking 117 and Cp 5 116 out of 120 ripe fruits, while the corresponding figures for green were 97 and 101, respectively.

The cotyledons of eggplant seedlings inoculated with Cp 5 became chlorotic, bore numerous brown, necrotic spots, and dropped prematurely. Many dark green necrotic lesions also occurred on the leaves. Inoculated chilli seedlings developed a pin-point necrosis of the cotyledons and slight foliar symptoms. The fungus was also isolated from naturally infected chilli fruits growing in a diseased tomato field.

Walker (J. C.) & Kendrick (J. B.). **Plant nutrition in relation to disease development. IV. Bacterial canker of Tomato.**—*Amer. J. Bot.*, xxxv, 3, pp. 186–192, 1 fig., 1948.

This paper deals with the development of bacterial canker (*Corynebacterium michiganense*) [*R.A.M.*, xxiii, p. 414; xxvi, p. 427] in tomato plants grown in nutrient sand-cultures as described in previous studies in this series [ibid., xxv, p. 424]. The inoculum was prepared from frozen tissue of tomato plants in which the pathogen had been grown. From the isolations a single colony was transferred to nutrient dextrose broth for five days at 24° C., centrifuged, and the bacterial mud suspended in saline (0·85 per cent. sodium chloride) at the rate of 7 gm. per l.

In October and November, 1946, the tap-roots of four-week-old Bonny Best tomato plants were cut beneath the surface of the bacterial suspension; control plants were cut in saline solution. The plants were replanted immediately and kept at 28°, the daylight being supplemented by artificial light from 40-watt fluorescent lamps. Ten days later general wilting symptoms developed on the inoculated plants which were exposed to direct sunlight.

Disease readings taken from the 14th day onwards showed that increases of salt concentration up to twice (2 H) that of Hoagland and Snyder's solution [loc. cit.] caused a significant increase in disease development. Up to 25 days after inoculation the symptoms in all plants consisted of a progressive wilting beginning with the lowest leaf. After 25 days, at the two highest concentrations (2 H and 3 H) the wilting continued until all leaves had collapsed and shrivelled, followed by the death of the plant. Light stem-streaking developed but canker formation was rare. At the 0·1 H and 0·5 H concentrations, on the other hand, plants with only a few wilted leaves developed numerous cankers beginning at the node and progressing down the stem; the relation of canker formation to nutrient concentration was the opposite of that of wilt development.

In a second experiment, run from December to February, plants of five different ages were inoculated at the same time. The first symptoms appeared in the youngest (14-day-old) plants seven days after inoculation. In the 48- and 55-day-old plants the disease progressed more slowly. Disease development was significantly more rapid at 2 H than at 0·1 H and 0·5 H, regardless of the age of the plants at the time of inoculation. Canker development was again highest in plants grown in the lowest concentrations, but few cankers developed at any nutrient level in the plants inoculated at 48 and 55 days.

Plants grown at pH 8 developed the disease most rapidly; those at pH 4 came next, the slowest development occurring at 6·5. The last level was the most favourable for plant development.

Different levels of nitrogen, potassium, and phosphorus had no significant effect on wilt development. The authors point out that *C. michiganense* is a phloem-invader and responds to nutrient concentration in a manner diametrically opposite to that of the agent of *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: loc. cit.], which is a xylem-invader.

Hutton (E. M.) & Wark (D. C.). **Tomato big bud.**—*J. Aust. Inst. agric. Sci.*, xiii, 4, pp. 188–190, 1 fig., 1947.

Lack of variation in the physiological response to big bud virus disease [*R.A.M.*, xxii, p. 457; xxvii, p. 341] among tomato varieties examined in the Murrumbidgee Irrigation Area during 1945 and 1946 indicates that it may be difficult to find resistant lines suitable for developing varieties resistant to big bud.

Goidànich (G.), Vivani (W.), & Mezzetti (A.). **La 'lebbra' del Pioppo.** [Poplar 'leprosy'.]—8 pp., 4 pl., Casale Monferrato, Istituto Sperimentale per la Pioppicoltura, 1947.

Two or three years ago, Canadian poplars [*Populus 'canadensis'*] growing near Pisa became affected by a condition which caused the death of some of the trees in 1946. Ochraceous-brown, dry, ogival lesions about the size of a hand, at first more or less smooth, developed at the base of the trunk, usually on the north side. The lesions were very superficial at first and showed no trace of fungal infection. During the summer, they spread over half to three-quarters of the circumference of the trunk, turned dark brown to nearly black, and developed deep longitudinal cracks, from which a blackish-yellow fluid exuded. The surface of the bark became covered with carbonaceous pustules consisting of the fructifications of various fungi. The tissues became more deeply affected, and the wood turned reddish-brown in places. Towards the end of the summer, the bark broke up and flaked off from the base of the trunk upwards, leaving a bare cylinder. The injury caused by the primary lesions and by secondary parasites reduced the commercial value of the tree.

In the cracks of the rhytidome were aphids covered with a white, waxy substance. A study of the literature showed that a similar condition of poplar is associated

with the aphid *Phloemyzus passerinii*, and it appears that the disease may be due initially to an insect of this group, followed by complex fungal infection. Further work is in progress.

KNOYLE (J. MARY). **Perithecia of Oak mildew.**—*Nature, Lond.*, clxi, 4102, p. 938, 1948.

Perithecia of *Microsphaera alphitoides* [*R.A.M.*, xxvi, p. 363] were found on oak (*Quercus robur*) leaves at Aberystwyth on 2nd October, 1947. This appears to be the second record for Britain of perithecial formation in the mildew.

PIMENTEL (A. A. L.). **Primeiras notas para o estudo de uma doença do Castanheiro e Nogueira observada nos viveiros florestais e causada por um Ficomiceta.** [Preliminary notes for the study of a Chestnut and Walnut disease observed in our forest nurseries and caused by a Phycomycete.]—*Publ. Direcc. Serv. flor. aqüíc.*, ix, pp. 176–187, 3 pl., 1942. [English summary. Received May, 1948.]

Visits to a number of nurseries in northern Portugal in June and September, 1941, revealed the presence of a serious disease of chestnuts and walnuts. The first external symptom was a slight foliar chlorosis, followed by decay of the leaves and finally by the death of the tree within a few days. An inspection of the roots of 15-month-old chestnuts disclosed a damp, black rot of the tissues of the cortical parenchyma and the upper strata of the central cylinder, mostly extending as far as the collar and often accompanied by the dark chestnut coloured, necrotic lesions along the stem, which extend on dead material. While the plants are still living, slightly sunken longitudinal stripes are formed on one side of the stem only, reaching up to a height of 9 cm. above the collar. In walnuts the blackening of the root tissues was even more pronounced than in chestnuts. The stripes on the stem extended to a height of 5 cm. above the collar.

The Phycomycete isolated from the diseased tissues could not be induced to form sexual organs in culture, and therefore its exact identification has not hitherto been practicable. It is suggested, however, that a strain of *Phytophthora cambivora*, the agent of ink disease [*R.A.M.*, xxvii, p. 165], is responsible for the trouble. The pathogenicity of the fungus was demonstrated by inoculations on young chestnuts; walnuts were not attacked. Since the nurseries were located in isolated areas, infection is presumed to have been seed-borne.

WATERMAN (ALMA M.) & MARSHALL (R. P.). **A new species of Cristulariella associated with a leaf spot of Maple.**—*Mycologia*, xxxix, 6, pp. 690–698, 2 figs., 1947.

In the summer of 1941 the authors observed the defoliation of a box elder (*Acer negundo*) at the Bartlett Tree Research Laboratories, Stamford, Connecticut. Similarly affected leaves of sugar maple (*A. saccharum*) and sycamore (*A. pseudoplatanus*) were also received from New York and Pennsylvania. Isolations from the diseased leaves yielded *Cristulariella pyramidalis* n.sp.

The yellowish-grey, marginate spots, bearing a number of light brown, raised, concentric rings on the upper surface, resulting in a target-like appearance, are the most characteristic symptom on all hosts. The spots vary in size, sometimes coalescing over large areas, and are usually much larger on sugar maple than on the other two hosts. On the lower surface the spots are brown without concentric rings. Hyaline, branching conidiophores, bearing pyramidal heads of minute, globose, hyaline conidia, 2 to 4 μ diam. may occur on both surfaces, but were found more frequently on the lower. In culture the fungus produced conidia and occasional, shining black sclerotia. It differs from *C. depraedans* [*R.A.M.*, ix, p. 690] in the branching of the conidiophore, which results in the pyramid-shaped head.

Nicolas (G.) & Aggéry [Berthe]. **Sur la maladie des Platanes.** [On the Plane disease.]—*Bull. Soc. Hist. nat. Toulouse*, lxxxi, pp. 103–109, 1946. (Issued 1947.)

Observations on the plane (*Platanus occidentalis*) disease caused by *Gnomonia veneta* [*R.A.M.*, xxiv, p. 460] in the region of Toulouse are described and important contributions to its symptomatology, etiology, and taxonomy summarized, with special reference to those of Leclerc du Sablon (*Rev. gén. Bot.*, iv, pp. 473–480, 1892) and Beauverie (*C.R. Acad. Sci., Paris*, cxxxvi, pp. 1586–1588, 1903) in France and Sempio in Italy [*R.A.M.*, xii, p. 796].

Young (R. A.) & McNew (G. L.). **Destruction of seedling Crataegus mollis by Gymnosporangium globosum in Iowa.**—*Plant Dis. Reptr*, xxxi, 12, pp. 484–486, 1947. [Mimeographed.]

During 1947, stands of hawthorn (*Crataegus mollis*) seedlings at the State Forest Nursery, Ames, Iowa, were severely damaged by *Gymnosporangium globosum* [*R.A.M.*, xv, p. 512], numerous aecidia of which were found on the lower parts of swollen stems of affected plants. Two adjacent rows of red cedar (*Juniperus virginiana*) used as a windbreak were heavily infected with both *G. globosum* and *G. juniperi-virginianae*. At distances of 120 to 160, 160 to 200, and 200 to 240 ft. from the nearest cedar the total infection was 46·4, 49·3, and 48·3 per cent., respectively, while at 360 to 440 it was 21·6 per cent., and at 440 to 520, 29·6. Injury to seedlings of *C. mollis* from these fungi may be a limiting factor in the establishment of mixed stands with red cedar.

Hamilton (J.) & Gilbert (S. G.). **The relation of fertilization with copper and nitrogen to copper deficiency symptoms, leaf composition, and growth of Tung.**—*Proc. Amer. Soc. hort. Sci.*, l, pp. 119–124, 1947.

The results of experiments carried out at Hague, Florida, in 1943 demonstrated that copper deficiency symptoms on tung trees (*Aleurites fordii*) [*R.A.M.*, xxv, p. 16; xxvi, p. 178] given a low rate of nitrogen fertilizer became much more severe when higher rates were applied. Potassium decreased the incidence of the deficiency symptoms.

The evidence obtained in 1944 showed that very little copper deficiency occurred when low rates of nitrogen were supplied, irrespective of the amount of copper given. The combination of high nitrogen and low copper caused serious copper deficiency.

Boudru (M.). **Contribution à la biologie de Crumenula abietina Lag.** [A contribution to the biology of *Crumenula abietina* Lag.]—*Parasitica*, iii, 1, pp. 1–37, 3 pl., 1947. [Flemish summary.]

In this study, published as Travaux Série C, No. 7 of the Station de Recherches forestières de Groenendael, after referring to the prevalence of *Crumenula abietina* on wilting Corsican pines (*Pinus nigra* var. *calabrica*] in Belgium [*R.A.M.*, xxvii, p. 205], the author presents a detailed analysis of T. Lagerberg's account of the fungus as observed in Sweden (*Medd. Skogsförsöksanst., Stockh.*, x, pp. 9–43, 1913). He also refers to Jorgensen's identification of *Brunchorstia destruens* with *C. abietina* [*R.A.M.*, xxv, p. 283].

In Belgium, the apothecia range from 0·3 to 1·2 mm. diameter. Lagerberg stated that on *Picea excelsa* [*P. abies*] the fructifications were grouped or isolated, but the few apothecia observed on this host in Belgium were always isolated; on pines, however, they were very numerous, usually grouped, occasionally isolated. The apothecia, as observed by the author, are shortly pedicellate or sessile, and generally the height (0·4 to 0·6 mm.) is less than the diameter though often the same and sometimes greater, the fructification then resembling an inverted, truncated cone.

The apothecium is fleshy when young or moist, and coriaceous or horny when old and dry, blackish-brown according to Lagerberg and yellowish-brown to rather blackish-brown in Belgium. The subhymenium is formed of light yellow cells with a dark yellow or brownish-yellow excipulum, the outer edges of which and the stipe are rather dark brown. After spore discharge the yellowish or brownish-yellow tissues below can be seen. The hymenium is brownish, greyish, or blackish, curved, later plane, smooth, with an indented, generally less dark, often light grey rim, incurved in dry weather and spread out when wet. A few paraphyses were found. All the different spore shapes recorded by Lagerberg were observed, the 1 to 8-celled averaging 38 to 40 by 7 to 8 μ. The asci measured 85 to 115 by 9 to 15 μ. The branched asci described by Lagerberg were not observed but some with lateral swellings were seen. When very young the apothecia appeared as bright sulphur-yellow, spherical bodies protruding from the bark. Later they turned brownish-yellow or brown, swelled, became hollow at the summit, flattened, spread out into a disk, and finally opened. In young fructifications the eight biseriate, unicellular spores were often observed to be massed together in the upper half of the ascus. Observations in Belgium indicated that as a rule the apothecia of *C. abietina* began to form towards the end of summer, becoming mature and ready to discharge their spores early in spring. The speed with which the fungus develops appears to depend on seasonal humidity; in mild, wet winters, maturity seems to be reached very early.

Describing cases in which the fungus appears to be to some extent parasitic, the author states that in Belgium the wilting of the shaft and lateral branches of *P. abies* described by Lagerberg appears to be due to frost damage.

The localities where *C. abietina* was observed as a more or less secondary parasite on *Picea* and *Pinus* spp. are listed, and the species and varieties of conifers on which the fungus occurs saprophytically are enumerated.

Discussing the parasitism of the fungus on its different hosts, the author concludes that *C. abietina* is not primarily parasitic. At the most, it is only a secondary parasite. Control depends on protecting the trees from injury and keeping them in a healthy condition.

Rennerfelt (E.). **Några undersökningar över olika rötsvampars förmåga att angripa splint- och kärnved hos Tall.** [Some investigations on the aptitude of different rot fungi for the infection of sap and heartwood of Pine.]—*Medd. SkogsforskInst., Stockh.*, xxxvi, 9, pp. 1–24, 2 figs., 1 diag., 2 graphs, 1947. [English summary.]

The resistance to fungal invasion of Scots pine (*Pinus sylvestris*) sap and heartwood samples from the stem bases of trees situated in five localities of Sweden was investigated by means of experiments in Kolle flasks, in which inoculated blocks were exposed for four months to the action of *Coniophora puteana, Merulius lacrymans, Lentinus lepideus, Lenzites sepiaria, Polyporus* [*Fomes*] *annosus, P.* [*F.*] *pinicola, Poria vaporaria, Trametes* [*F.*] *pini, T. serialis*, and *T.* [*L.*] *trabea*.

The sapwood was largely destroyed by the fungi, especially *C. puteana, Lentinus lepideus, M. lacrymans*, and *P. vaporaria*, which caused average weight losses of 34·6, 41·6, 42·7, and 50·7 per cent., respectively, during the experimental period. The heartwood reacted very variably, the average losses in the outer layers attacked by the above-mentioned organisms being 13·7, 31·8, 5, and 17·3 and in the inner ones 29·6, 37·8, 20·8, and 31 per cent., respectively. In general, pine heartwood appears to be fairly resistant to fungal infection, as previously demonstrated by Cartwright and Findlay [*R.A.M.*, xviii, p. 361]. No correlation could be established between the density or width of the annual rings and resistance to decay, but there does seem to be a connexion between the capacity to withstand infection and the phenol content of the heartwood. The author's earlier investigations (*Svensk bot.*

Tidskr., xxxix, p. 311, 1945) showed that *L. lepideus* is less affected by the pinosylvin phenols than *C. puteana* and *M. lacrymans*, which are highly sensitive to these compounds [cf. *R.A.M.*, xxiii, p. 465]. In most cases, analyses of the test blocks revealed a higher phenol content in the peripheral than in the central layers. Further evidence of the toxicity of the pinosylvin phenols was afforded by experiments in the impregnation of sapwood blocks with pinosylvin (0·66 to 1·29 per cent.) and its monomethyl ether (1·05 to 3·01 per cent.) prior to inoculation with three of the wood-destroying fungi. The average weight losses in two lots of three blocks each treated with pinosylvin and inoculated with *C. puteana* were 16·6 and 13·5 per cent., the corresponding figures for *L. lepideus* being 18 and 13·5. In two untreated samples of sapwood *C. puteana* caused losses of 43·5 and 32·3 and in the heartwood of 25·8 and 25·6 per cent., the corresponding figures for *L. lepideus* being 45·4 and 45, and 39·4 and 41·7 per cent., respectively. The average losses in two series of sapwood blocks impregnated with pinosylvin monomethyl ether and inoculated with *C. puteana* were 18·4 and 9·2 and with *L. lepideus* 14·1 and 6·8 per cent., the figure for *P. vaporaria* (one lot of three blocks) being 8·7 per cent.

The relative dryness of the heartwood and its paucity of nutrient substances would appear to provide less favourable growth conditions for the fungi than those available in the sapwood, but the shortage of water seldom checks mycelial development. In two tests in the present series of experiments initially dry heartwood blocks absorbed sufficient water in a fortnight or so, both hygroscopically and in agar cultures, to permit of fungal growth.

Siggers (P. V.) & Lindgren (R. M.). **An old disease—a new problem.**—Reprinted from *Sth. Lumberm.*, clxxv, 2201, 4 pp., 4 figs., 1947.

Fifteen years ago the trunk and branch cankers produced by native rust fungi were common in forests but caused little damage. To-day, however, *Cronartium fusiforme* [*R.A.M.*, xxvii, p. 267] is proving a serious obstacle to the reafforestation programme in the south of the United States by killing young stands of slash [*Pinus caribaea*] and loblolly [*P. taeda*] pines, especially in the lower Gulf Region [ibid., xx, p. 187]. The increased prevalence of the disease is due partly to the planting of susceptible pines and oaks on land previously occupied by longleaf pine [*P. palustris*] and partly to the wide distribution of rust-infected nursery stock [ibid., xxii, p. 231] in some earlier plantings. Although the amount of disease generally varies according to the relative susceptibility of the prevailing pines and oaks, towards the north and west the weather-rust relationship reduces infection among susceptible pines and oaks. The most widespread and damaging attacks occur in the southern part of the shortleaf [*P. echinata*]—loblolly—hardwoods forest, where loblolly pine and the more susceptible oaks prevail.

Trunk cankers may kill the tree or limit its usefulness, especially on seedlings or saplings, but branch cankers are seldom fatal unless they reach the trunk. The amount of rust damage in a given stand is closely related to density of stocking and the number of stem infections developing within the first ten years. Stands which escape heavy damage within this period should reach felling age without serious damage. Recent studies have shown that abundant infection on pines is induced by at least 18 consecutive hours of atmospheric humidity close to saturation and with temperatures between 60° and 80° F. Reports indicate that trees may show increased susceptibility on burned sites when dormancy is broken earlier, or as a result of various cultivation practices which increase the growth of young pines. There are indications that certain strains of loblolly pine, usually those coming into leaf later, are practically resistant to infection.

Control measures include spraying nursery stock [ibid., xxi, p. 111] and culling infected material, planting slash and loblolly pines on sites having a low level of infection where possible, minimizing damage by planting and maintaining dense

stands, and pruning infected branches before the cankers reach the stem following an occasional year of heavy infection, thus reducing stem damage.

Birkinshaw (J. H.), Stickings (C. E.), & Tessier (P.). **Biochemistry of the wood-rotting fungi. 5. The production of D-threitol (l-erythritol) by Armillaria mellea (Vahl) Quélet.**—*Bio-chem. J.*, xlii, 3, pp. 329–332, 1948.

A freshly isolated malt agar culture of *Armillaria mellea* from a horse-chestnut tree at Pinner, Middlesex, transplanted to a synthetic liquid medium, gave rise to *d*-threitol (*l*-erythritol) in the mycelium, the yield being about 13 per cent. of dry weight. There is stated to be no previous record in the relevant literature of the natural occurrence of the optically active forms of erythritol.

Khristov (A.) & Raikov (E. B.). Действие на праховидните фунгисиди върху кълняемостта на зеленчукоевите семена при максимално напрашване. [The effect of fungicidal dusts on the germination of vegetable seed when maximum dusting is employed.]—Reprinted from Семепроизводство [*Seed Production*], iv, 1–2, 6 pp., 1945.

In comparative tests conducted over a period of ten years in Bulgaria, the highest germination rates of vegetable seeds treated with fungicidal dusts were as follows: red cabbage with porzol [*R.A.M.*, xvii, p. 450] 87·75 per cent., tillantin R. [ibid., xxvi, p. 187] 85·75, control 79·5; white cabbage with copper carbonate [ibid., xxvi, p. 324] 82·5, tillantin 78·75, control 60·5; dill [*Peucedanum graveolens*] with copper carbonate 76, ceresan 71·25, control 67·5; pepper with tillantin 98·25, control 95·75; radish with copper carbonate 84·25, tillantin 82·25, control 44·25; lettuce with porzol 88, copper carbonate 81·75, control 81·5; eggplant with tillantin 73·25, porzol 69·75, control 45. In one test granosan and ceresan completely controlled *Alternaria radicina* [ibid., xxv, p. 378] on heavily infested carrot seed.

Aberdeen (J. E. C.). **Seasonal notes on the control of vegetable diseases.**—*Qd agric. J.*, lxiii, 6, pp. 344–345, 1946. [Received April, 1948.]

Both high temperatures and the incidence of bacterial wilt [*Xanthomonas solanacearum*: *R.A.M.*, xxvi, p. 319] and *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: ibid., xxvi, p. 472] hinder tomato production during January and February in Queensland. Control depends on the choice of varieties and the planting site. Sensation is the only variety which shows any resistance to bacterial wilt. In areas where the disease is prevalent, plantings should be confined to the drier ridges or delayed until April. Rutgers, Pearson, and Pritchard [loc. cit.] are sufficiently resistant to *Fusarium* wilt for the January plantings, while Break o' Day and Red Marhio are more suitable for planting after February.

Heavy rains early in 1946 caused a widespread attack of black rot [*Xanthomonas campestris*: ibid., xxiv, p. 217] among cabbages and cauliflowers, for the control of which seed treatment by heat or with mercuric chloride is recommended.

Lettuce is widely attacked by *Septoria* leaf spot [*S. lactucae*: ibid., xxiv, p. 135], but the disease can be avoided during summer by maintaining rapid and vigorous growth.

Bontea (Vera). **Micromycètes parasites, nouveaux pour la Roumanie.** [Parasitic microfungi new to Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxv, 7, pp. 435–442, 7 figs., 1943. [Received April, 1948.]

Detailed notes are given on the following fungi in Rumania [cf. *R.A.M.*, xxvii, p. 274]: *Cercosporina* [*Cercospora*] *anethi* [ibid., xxv, p. 439], *Phoma anethi*, [loc. cit.], and *Sporodesmium pluriseptatum* [loc. cit.; xxv, p. 582]. The first was found on *Anethum* [*Peucedanum*] *graveolens* on sale in the Bukharest market in the autumn of 1942. The fungus forms dark brown stripes on the leaves, stems, and

inflorescences, resembling at first a rust. The pustules when open assume a greyish, velvety appearance. The conidiophores, arising from a spherical pseudostroma, are rigid, sinuous, denticulate, unicellular, olivaceous at the base, hyaline towards the apex, and measure 75 by 6 μ. The hyaline, straight or slightly curved, cylindrical-fusiform conidia are rounded at the extremities, mostly uniseptate, and measure 21 to 51 by 4 to 7 μ. Synonyms given are *Marssonina kirchneri* [ibid., ix, p. 613] and *Fusicladium depressum* f. *petroselini* Moesz [ibid., xvi, p. 493]. Examination of the Moesz herbarium material showed the latter to be identical with the author's fungus.

Phoma anethi was found in association with *C. anethi* [ibid., xvii, p. 771]. The isolated, spherical or somewhat flattened pycnidia occurred in an elongated, rather undeveloped, blackish stroma between the ridges on the stem. They were 90 to 180 μ in diameter, having a 3- to 4-layered wall and a not very prominent, papillate orifice. The hyaline pycnospores measured 2·5 by 1 to 1·5 μ. It is distinguished from several other *P.* spp. found on the same host by smaller, non-guttulate spores.

S. pluriseptatum caused severe leaf spot and leaf curl of cucumber plants at Rasnov in 1942, the leaves drying up and the stems wilting; the entire planting appeared scorched, and the yield was reduced. The conidiophores measured 30 to 45 by 5 to 6 μ and the conidia from 21 to 66 by 9 to 16 μ.

All these diseases should be treated by removing and burning the infected plants and practising a three or four years' rotation.

WARING (E. J.), SHIRLOW (N. S.), & WILSON (R. D.). **Molybdenum in relation to whiptail of Cauliflower.**—*J. Aust. Inst. agric. Sci.*, xiii, 4, pp. 187–188, 1947.

During 1947 an experiment was carried out at Cornwallis, Windsor, New South Wales, to determine the effect of sodium molybdate on 'whiptail' disease of cauliflower [*R.A.M.*, xxvi, p. 38], which has caused considerable losses among commercial crops in the State [ibid., xiii, p. 344] for many years.

Whiptail was most severe on plots treated with sulphur with or without ¼ lb. sodium molybdate per acre. In the remaining 28 plots, seven plants were lightly to moderately affected, three on the sulphur (500 lb.) plus 1 lb. sodium molybdate plots, three on the untreated, and one on a plot receiving ¼ lb. sodium molybdate alone. No trace of whiptail occurred on plots receiving 2 tons dolomite, the same plus 4 lb. sodium molybdate, the latter alone, or 1 lb. sodium molybdate per acre alone. On completing the experiment it was found that plots which had received sulphur had an average pH of 6·1, the untreated 6·8, and dolomite (1 and 2 tons) 7·2 and 7·7, respectively.

It appears, therefore, that 1 lb. sodium molybdate was sufficient to prevent all but a trace of whiptail on land treated with sulphur. It also appears that the relationship of soil acidity to whiptail depends on the fact that the availability of molybdenum decreases with the increase in soil acidity.

LIMASSET (P.). **Nomenclature des virus phytopathogènes.** [The nomenclature of phytopathogenic viruses.]—*Ann. Épiphyt.*, N.S., xii, pp. 317–323, 1946. [Received May, 1948.]

After a brief critical review of the views on virus nomenclature put forward by Quanjer [*R.A.M.*, x, p. 745], Johnson [ibid., vi, p. 501; xiv, p. 521; xxi, p. 343], Smith [ibid., xvii, p. 52], Holmes [ibid., xviii, p. 607], Valleau [ibid., xxi, p. 535], Fawcett [ibid., xxi, p. 343], Thornberry [ibid., xx, p. 219], and Bawden [ibid., xxiv, p. 137], the author concludes that whatever the conflict of opinions at present may be, some system should be generally adopted, at any rate for the time being. On the whole, he considers that the best course would be to follow the classification of Holmes with McKinney's modifications [ibid., xxiii, p. 427]. The paper concludes with a key to McKinney's system of classification.